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American Steel:

Responding to Foreign Competition

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Introduction

On September 18, 1984, President Reagan announced that he was rejecting the recommendation of the International Trade Commission to institute a mandatory import quota of fifteen percent of the U.S. steel market. The Administration opted instead for negotiations with Brazil, Japan, Korea, and Spain for "voluntary export restraints" that would reduce steel imports to an 18.5 percent share. At the time, the President's compromise was hailed as both a victory for free trade and a victory for the steel industry. In the long run, it will likely prove to be neither.

Recent news reports estimate that voluntary restraints may reduce imports to about 22.5 percent, much closer to the current import level of 26 percent than originally hoped for. This would not please the steel industry and it could result in pressure for the 99th Congress to dust off some of the legislation (H.R. 5081 and S. 2380, the "Fair Trade in Steel Act") introduced in the previous session to limit imports to fifteen percent. The House bill had over 200 co-sponsors although it faced stiff opposition in the Senate. While a cry of "trade war" might be extreme, our already-strained relations with Japan and the European Economic Community are undergoing further stress as a result of such unilateral action.

What is most disturbing about the application of quotas (by whatever name they are called) to the steel industry's problems is that they will cost the American people $5 billion annually while producing no net benefits to our economy. As this report demonstrates, Big Steel's gains will likely result in far greater losses for America's steel-using sectors. To properly address the steel industry's woes, we must deal with root causes.

This report first identifies the symptoms of malaise in American steel—it is these symptoms that are being treated by trade protection remedies. The underlying causes of the decline in this industry are then identified, followed by an analysis of the "problems with the solutions" being touted in Washington. The last section of the report suggests both private and public responses that are more appropriate remedies for the basic problems besetting the steel industry.

Symptoms of the Malaise in American Steel

The American steel industry has suffered severely since 1981, by any measure.* Employment has declined from 391,000 jobs in 1981 to 243,000 in 1983, a 38

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*Technically, the steel industry is made up of the carbon steel producers and the specialty steel firms. In terms of employment and tons of product, the specialty steel sector is small compared with the carbon steel sector. Unfortunately, production and employment statistics are rarely disaggregated.

percent drop in a period of just two years. The industry incurred losses totaling $6.8 billion in 1982 and 1983. Long-term debt soared and debt/equity ratios more than doubled. Raw steel capacity has dropped over 19 million tons from 1981 to 1983.[1]

To a large extent, these adverse trends are due to the same forces as those besetting the steel industries in all industrialized countries. But our problems are certainly more severe than in some other nations, particularly Japan. Why is this so? Are the sources of the industry's problems due to imports, managerial mistakes or other factors?

Longer-term View of the Steel Industry

Several facts are abundantly clear, and these were clear long before the current "crisis." First, the American steel industry has been sick for a long time—at least since 1959. In only one year during the past 25 has the industry earned a rate of return on equity equal to the average for all manufacturing.[2] Even during the ten-year period from 1969 to 1978, which includes the most profitable years for U.S. steelmakers since 1959, the industry's financial performance was poor.

It was not for lack of trying. The American steel industry invested over $24 billion (in constant 1978 dollars) during that period, far more than the profits the companies earned. In contrast, only $7.2 billion was paid out in dividends. Yet, in spite of the huge reinvestment, the industry's stock declined 50 percent ($8 billion) in market value.[3] This implies an annual return on equity of minus 8 percent. It is not hard to understand why the integrated steel industry is complaining about its inability to raise capital. Even during relatively good times their returns from capital investments have been very disappointing.

A second problem has been the very slow rate of productivity growth. Donald Barnett, former chief economist at the American Iron and Steel Institute, the industry trade association, has calculated that the U.S. integrated steel industry labor productivity increase averaged only 2-3 percent a year between 1958 and 1980.[4] Only two completely new integrated steel mills have been built in the U.S. since World War II, and those plants, using the older open hearth technology, were considered to be obsolete by 1960.[5]

By comparison, 80 percent of the steel capacity in Japan and the newly industrialized countries was built since 1945, most of it using the newer basic oxygen furnace (BOF).[6] While almost all U.S. integrated capacity has been retrofitted with BOF, we are still far behind in the application of continuous casting, the other major technological change for integrated mills. The process bypasses several steps by working the metal while it is still hot from the steelmaking

> *The reluctance of American managers and union leaders to admit to the lack of technological progress produced a steel industry that employs the highest cost steelworkers in the world but which is technologically behind the Japanese.*

furnace. This saves on energy costs and greatly reduces yield loss as raw steel is processed into finished products. This latter factor alone is responsible for a 10 percent Japanese advantage. The Japanese get .91 tons of sheet steel from each ton of raw steel, while U.S. mills produce only 0.83 tons.[7] In 1981, the Japanese used continuous casting for 60 percent of their steel output while only 22 percent of U.S. steel was processed using this important technique.[8]

Unfortunately, the American steel industry took somewhat of a "head in the sand" view of its problems during the late 1970s. Some contemporaneous quotes from the trade press make that point clearly:

*"Taken as a whole, the domestic industry employs the most advanced steelmaking technology in the world."[9]

*"New technology has not been and is not likely to be the answer to the immediate profit problem."[10]

*"So there's no question that, overall, our steelmaking technology today is second to none."[11]

*"There is no new steelmaking technology in sight."[12]

Luc Kiers, a steel industry consultant, comments:

> Most major steelmaking technologies used today in the U.S. steel industry originated outside the United States. Unbelieveable as it may sound, if history is proof, all current steelmaking processes in the world's steel production will at sometime in the future be displaced by newer methods.[13]

The reluctance of American managers and union leaders to admit to the lack of technological progress during the 1970s produced today's legacy—a steel industry, as shown in Table 1, that employs the highest cost steelworkers in the world but which is technologically behind the Japanese.

Identifying the Causes

Global Aspects of Steel's Decline

The world steel industry was booming in 1974. United States steel exports increased sharply and reached almost 6 percent of U.S. production. The euphoric mood in steel gave rise to forecasts of continued strong growth in demand through 1985; e.g., the industry press forecast increases in domestic U.S. steel demand of over 30 million tons by the 1980s.[14] As recently as 1979, experts stated that the early 1980s would see shortages of capacity, as very little new supply would be added in the U.S. and Europe.

Today the steel industry has enormous worldwide excess capacity. In 1983, Western world steel usage stood at 408 million tons while capacity was 611 million tons, leaving an excess capacity of 33 percent.[15] Many steel mills in the United States and Europe have been closed and Japan may soon follow suit. What caused this collapse? Why did the industry not foresee its future?

Reduced demand. First, the worldwide recession, induced in some measure by the second round of OPEC oil price increases in 1979, is responsible for much of the problem in world steel. Most steel is used in construction and in producing other durable investment goods, which decline very rapidly during

Table 1

A COMPARISON OF STEEL INDUSTRY AND AVERAGE MANUFACTURING WAGES, SELECTED COUNTRIES, 1978

Country	Total hourly compensation for production workers: All manufacturing	Total hourly compensation for production workers: Iron and steel	Compensation ratio of iron and steel to all manufacturing
United States	$8.33	$14.04	1.69
Europe			
Germany	9.48	10.60	1.12
Netherlands	9.77	12.01	1.23
Italy	6.18	6.98	1.13
Latin America			
Brazil	1.67	2.12	1.27
Venezuela	2.53	n/a	—
Mexico	2.00	n/a	—
Asia			
Japan	5.47	8.22	1.50
Korea	0.85	n/a	—
Taiwan	0.80	n/a	—
Hong Kong	1.13	n/a	—

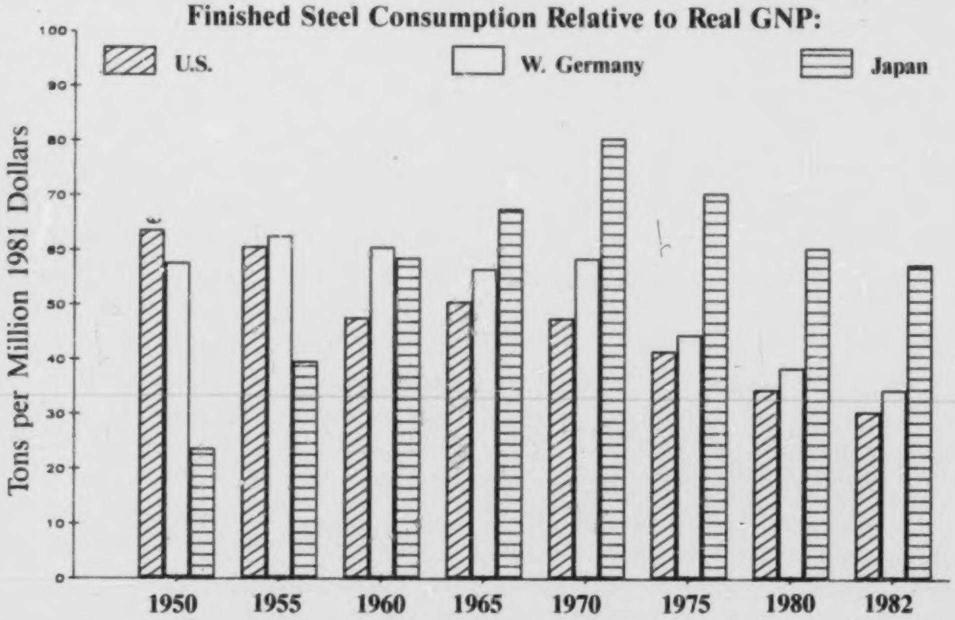
Source: Brookings Institution

recessions. The very sharp drop in steel production from 1981 to 1982 (over 45 million tons, or 47 percent) and the reduction in usage of almost 30 million tons (about 32 percent) suggests the cyclical nature of most of this decline.[16] However, this cyclical fluctuation occurred in addition to several adverse long-term trends.

A second factor has been the declining steel-intensity of output in the developed world. Figure 1 illustrates the gradual decline in the steel- intensity of GNP as incomes go up. After some stage of development, it appears that the new products that consumers demand involve less and less steel.[17] In 1974, the beginning of the OPEC era of high energy prices added a new element. The motor vehicle sector, in particular, has responded to high oil prices by making lighter automobiles using more aluminum and plastic, and less steel. Consumers also have responded to higher transportation costs by buying fewer new cars. The industrialized world has now arrived at an era of flat or very slowly growing steel consumption. Such a setting implies that overall growth can only occur through exports to the developing nations.

Figure 1

DECLINING INTENSITY OF STEEL USAGE IN WESTERN ECONOMIES


Finished Steel Consumption Relative to Real GNP:

Source: Barnett and Schorsch, *Steel: Upheaval in a Basic Industry*

Note: Cross-country comparisons are not meaningful; changes over time should be viewed as the relevant index.

Worldwide competition. The third negative factor influencing the U.S. steel industry has been the success of producers in Japan and newly industrialized countries (NICs). Robert Crandall, a prominent economist and authority on the steel industry, has analyzed the reasons for Japan's performance. He found that in 1959, the Japanese faced a substantial disadvantage compared to the U.S. in raw material (ore and coal) costs as well as labor productivity.[18] But its domestic market for steel was rapidly growing and wages were low enough to keep out U.S. imports. The Japanese arranged with the Australians and Brazilians to develop new, high-yield, iron ore deposits and built large ore handling facilities in deep-sea ports.

The Japanese also began to build larger bulk ore carriers. Typical ore carriers grew from 8,000 tons to over 75,000 tons. They also built new steel mills on their coasts to keep ore and handling trans-shipment costs at a minimum. By 1975, 82 percent of Japan's steel capacity lay in coastal areas with coterminous ore-handling facilities for unloading bulk carrier ships. In contrast, only 10 percent of U.S. capacity was similarly situated to take advantage of the now much cheaper and higher quality Australian and Brazilian ore.[19]

The importance of shipping costs is underscored by the fact that it costs only about one-third as much to ship a ton of steel from Yokohama to Los Angeles than to send it by rail from Chicago to Los Angeles.[20] The location of the American steel industry has been largely determined by the railroad network, the Great Lakes ore deposits, and the old, basing-point pricing system—all of which provided little incentive to locate in coastal areas. This may have been a disadvantage for American mills in the past. However, as discussed later in this report, this apparent disadvantage in location could be a key element in reviving the industrial heartland of America.

As the Japanese industry grew after 1959, it was able to build newer, larger, technologically modern mills with capacity that exceeded the average U.S. mill.[21] Nippon Steel's Oita works, for example, uses two blast furnaces to produce almost as much pig iron as the combined facilities of Republic Steel's fifteen furnaces.[22] Using new laborsaving devices, the Japanese plants became the most efficient in steel yield, and in labor and energy usage. The Japanese have also invested in research and development to maintain that technological advantage. For instance, their commitment to R & D in 1982, expressed as a ratio of R & D spending to sales, was nearly two and one-half times the corresponding figure for the U.S. steel industry. In fact, the American steel industry's R & D spending per sales dollar is less than any other U.S. industry except food processing and textiles.[23]

To summarize, Japanese raw material, labor, and shipping costs fell substantially while U.S. costs rose. Though Japanese steel wages rose 244 percent from 1958-1968, productivity increased more rapidly, thus reducing unit labor costs by 30 percent. During the same period, even though U.S. steel industry wages rose only 39 percent, this was enough to offset productivity growth. By the late 1970s, Japan became the world leader in steel technology and labor productivity. By 1980, it enjoyed a 10-20 percent advantage for most steel products (see Table 2 for details). Recent developments in the U.S. industry

Table 2

HISTORICAL COMPARISON OF U.S. AND JAPANESE LABOR PRODUCTIVITY

(Man hours per net ton of product)

	1958		1964		1972		1980	
	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan
Integrated								
Hot-rolled sheet	9	27	8	14	6	6	5	4
Plate	11	29	10	16	8	7	8	5
Cold-rolled sheet	12	36	10	19	8	8	7	6
Hot-rolled bar	13	32	12	17	10	7	8	5
Wire rod	12	28	11	14	8	6	6	4
Minimills								
Hot-rolled bar	14	38	10	19	6	8	4	4
Wire rod	14	35	9	17	6	7	4	3

Source: Barnett and Schorsch, *Steel: Upheaval in a Basic Industry* and low operating rates in Japan have helped to equalize productivity, but the U.S industry is still behind technologically.[24]

Even Japan is under competitive pressures due to the entry of increasing numbers of NICs into the steel market. In 1977, 9 NICs were each producing over one million tons of steel.[25] There are many non-industrialized countries which now have a large steel market but little or no domestic industry, and it is likely that some of them will be developing this industry over the next decade.

Crandall has convincingly argued that it is now much easier for such countries to develop their own steel industry, buying complete "turnkey" mills from Japanese firms which build them, install the equipment, train the workers and technicians and then turn over the working plant to its owners. A NIC can buy these facilities at about the same cost as U.S. or European firms and only 10 percent over Japanese capital costs.[26] The raw material and other non-labor costs are close to the same worldwide if the mill is built in an ocean port. Labor productivity in many of these new NIC mills is only about 20 percent lower than in Japan.[27] The much lower wages paid in these countries (see Table 3) yield both lower unit labor costs and lower overall production costs than in any industrialized country, including the U.S. and Japan.

Table 3

PRODUCTION COSTS IN NEW STEEL MILLS
(1978 U.S. $ Per Metric Ton)

	U.S. and EEC	Japan	Other Asia	Latin America
Labor	$108	$ 69	$ 22	$ 44
Raw materials	190	190	190	190
Capital costs	178	152	168	209
Total	$476	$411	$380	$ 443
Assumptions:				
Manhours/ton	7.7	7.7	11	11
Wage rate ($/hr)	14	9	2	4
Cost of facilities/ finished ton ($)	938	800	800	1000
Capital charge (percent per year)	17	17	19	19

Source: Brookings Institution

It seems likely that the only growth market for steel in the foreseeable future will be the developing world, which will become increasingly self-sufficient, as shown in Table 4. The NICs are currently the only places in the world where building new integrated steel capacity is profitable without trade protection or government subsidies. There is no obvious reason to expect that situation to change over the next 25 years.

Table 4

PROJECTED CHANGES IN FREE WORLD STEEL CONSUMPTION AND CAPACITY

(millions of metric tons)

	1980	Estimated 1985	Estimated 1990
Consumption			
North America	132	130	127
EEC	108	100	96
Japan	79	73	73
Other Industrialized Countries	46	47	50
Developing Countries	98	112	137
Total Free World	463	462	483
Steelmaking Capacity			
North America	152	—	128-146
EEC	190	—	145-159
Japan	142	—	140
Other Industrialized Countries	51	—	50-53
Developing Countries	60	—	112
Total Free World	595	—	575-610

Source: *Iron Age*, December 5, 1983, p. MP-9; and OECD, *OECD Steel in 1981* (Paris: OECD, 1983), p. 33.

Steel imports, largely from Japan and Western Europe, reached 15 percent of the American market in 1968. Import penetration fluctuated between 13-20 percent during the 1970s and is around 23-26 percent today. Just about a third of these imports are from the NICs (see Table 5). Among the factors contributing to the woes of U.S. steel makers is the recent rise in the value of

Table 5

STEEL MILL PRODUCT IMPORTS BY AREA OF ORIGIN

(in millions of metric net tons)

Year	Asia and Africa	% of Imports	Latin America	% of Imports	Japan	% of Imports	EEC	% of Imports[d]	Total Imports	% of U.S. Apparent Supply
1965	–[a]	0	0.2	1.4	4.6	43.0	5.1[b]	47.7[b]	10.7	10.6
1967	–[a]	0.3	0.3	2.5	4.7	43.9	5.9[b]	49.6[b]	11.9	12.7
1969	0.1	0.7	0.3	2.1	6.5	44.5	6.3[b]	43.2[b]	14.6	14.2
1971	0.3	1.6	0.6	3.2	7.3	38.6	8.6[b]	45.5[b]	18.9	18.4
1973	0.8	5.0	0.5	3.1	6.1	38.4	6.7	42.1	15.9	13.0
1975	0.5	4.2	0.1	0.8	5.8	48.3	4.1	34.2	12.0	13.5
1977	1.4	7.3	0.4	2.1	7.8	40.4	6.8	35.2	19.3	17.8
1980	1.6	10.3	0.6	3.9	6.0	38.7	3.9[c]	25.2[c]	15.5	16.3
1981	1.8	9.0	0.8	4.0	6.2	31.2	6.5	32.7	19.9	18.9
1982	1.8	10.8	1.0	6.0	5.2	31.1	5.6	33.5	16.7	21.8
1983	2.5	14.6	2.4	14.0	4.2	24.6	4.1	24.0	17.1	20.75

Source: American Iron and Steel Institute

Notes: [a] Less than 50,000 tons.
[b] Includes U.K. though not yet in EEC.
[c] Includes Greece though not yet in EEC.
[d] Totals include other countries not detailed above.

the U.S. dollar on currency exchange markets (see Table 6). The value of the dollar has increased 45 percent compared to the trade weighted average for 67 countries since 1980.

Table 6

EXCHANGE RATE INDICES-VALUE OF U.S. DOLLAR

(1980 = 100)

	67 Country Average[a]	14 Industrial Country Average[a]	West Germany	Japan
1970	96.2	122.6	200.6	158.0
1975	89.7	106.5	135.4	130.9
1976	94.6	109.5	138.6	130.9
1977	98.0	109.2	127.8	118.5
1978	95.6	101.0	110.6	92.9
1979	97.3	100.0	100.8	96.7
1980	100.0	100.0	100.0	100.0
1981	110.0	108.6	124.4	97.3
1982	127.5	119.0	133.6	109.9
1983	145.0	122.3	140.6	104.9

Source: Department of Commerce

Note: [a]Trade weighted average.

It is interesting to note, however, that the U.S. dollar/yen exchange rate has changed very little from 1980 to 1983; the dollar has appreciated only 5 percent during that time. Japanese imports, however, decreased from 6.5 million metric tons to 4.6 million and Japan's import share from 39 percent to 25 percent.

The dollar has appreciated 22 percent from 1980 to 1983 relative to a trade weighted average for fourteen industrialized countries. Meanwhile, European Economic Community exports to the U.S. have remained nearly constant, about 4 million metric tons. The lofty value of the dollar is nearly identical with its relative value to this bundle of currencies in 1970-71, when EEC imports were nearly twice their current level.

Since 1980, more relevant factors other than the exchange rate have played a dominant role in the ability of U.S. steel to compete for the U.S. market. A weaker dollar will not erase the cost advantages enjoyed by Japan and the NICs.

Problems with a "Made in USA" Label

It does appear that many of the domestic steel industry's problems are of its own making, with labor and management both sharing in the blame. In the late 1950s, our steel labor was three times as productive as Japan's; by 1980, they were equally productive; now the Japanese are ahead.

The problem of work rules and wages has been fundamental in the American integrated carbon steel industry. In 1970, U.S. steelworkers were moderately well-paid, receiving wages about one-fourth higher than the average U.S. manufacturing worker—a wage differential similar to that in Japan. By 1982, members of the United Steel Workers (USW) were receiving a premium of 64 percent above average U.S. manufacturing wages.[28]

This huge increase in wages had three major effects. First, since wages far exceeded productivity gains, unit labor costs grew rapidly—1.8 percent annually since 1971 (while unit labor costs fell in Japan). Second, the large amount of cash flowing to labor reduced profitability and made it more difficult to finance capital improvements. Over the period 1970 to 1982, the escalating wage differential amounted to $26 billion (in 1982 dollars), a sum very close to total investment in plant and equipment in the steel industry during the period.[29] Finally, the higher wages created expectations on the part of steelworkers which the steel firms and the American economy simply could not afford to meet.

The higher wages make U.S. firms unable to compete with foreign firms without some technological advantage. Ultimately, this large run up in wages causes more unemployment in the steel industry. The United Steel Workers admitted the obvious negative relation between wages and jobs when it accepted wage freezes and reductions during the recent recession. As things stand, only actions which cause major increases in productivity (such as technological or work rule changes) will enable the U.S. integrated steel producers to compete more effectively with foreign integrated mills.

In 1970, steelworkers received wages about one-fourth higher than the average U.S. manufacturing worker but by 1982 that wage premium was nearly two-thirds. This increase in wage differential alone amounted to $26 billion.

Domestic Competition from the Minimills

Even without import competition, the larger integrated mills are losing out to domestic competitors—namely U.S. "minimills." These electric furnace mills largely use scrap instead of ore and are located in the urban areas they serve. The minimills had only 3 percent of the U.S. market in 1960, but 20 percent today.[30] They have remained profitable throughout the period, even during the recent recession when the integrated firms lost over $6.7 billion. These minimills can produce a ton of finished steel product with $60 of labor compared to $131 for an integrated mill.[31] Moreover, their capital costs are approximately one-half those of the large mills.[32]

Minimills can compete head-to-head with foreign steel. For example, since Nucor Steel's Utah plant opened in 1981, it has recaptured 35 percent of the domestic market for its products from Japanese and South Korean competitors,[11] leaving these Asian producers with only 15 percent of the West Coast market.

Employment and Output Prospects for American Steel

The future of the American steel industry cannot be forecast with certainty but a reasonable estimate of output and employment can be quantified. Table 7 summarizes projections for output and employment based on assumptions used in several recent analyses. Assuming no growth in domestic demand or imports, the minimill share of domestic shipments will grow as the result of

Table 7

FORECAST OF FUTURE COMPOSITION AND EMPLOYMENT IN THE U.S. STEEL INDUSTRY

	1984	1990	2000	Units
Usage	105	105	105	Millions of Metric tons
Imports	23	23	23	M tons
Domestic Shipments	82	82	82	M tons
Integrated	66	61	54	M tons
Minimill	16	21	28	M tons
Minimill Share[a]	20	26	34	Percentage
Minimill Annual Growth		4.5	2.9	Percentage
Productivity				
Integrated[b]	250	300	404	Tons/employee
Minimill[b]	500	761	1532	Tons/employee
Employees				
Integrated	264	203	134	thousands
Minimill	32	28	18	thousands
Total	296	231	152	thousands

Source: Center for the Study of American Business

Notes: [a] Based on Barnett and Schorsch, p. 280.
[b] At 3 percent improvement annually for integrated, 7 percent for minimill.

the gradual move into new products and further reduction of import shares in those minimill products. In contrast, even without increased import penetration, integrated carbon steel production is likely to decline by 12 million tons by the year 2000, 18 percent below current levels.

The productivity assumptions used in this estimate reflect a continuation of rapid change in the minimill sector (7 percent a year) and an increase in productivity by the integrated sector (3 percent a year), somewhat better than the 2-3 percent during the 1958 to 1980 period. The overall result is an estimated decline in domestic steel employment of almost 50 percent (from 296,000 to 152,000) by the year 2000. Since the median age of American steel employees is 42, a substantial portion of this reduction can occur through attrition.

What other factors might change this forecast? First, the growth rate of the minimill sector may be underestimated. It has expanded at an annual rate of 10 percent the past 25 years.[14] The Barnett-Schorsch estimates imply a substantial reduction in this growth rate. If the assumed productivity trend continues, this could result in a higher growth rate, closer to the recent trend. It is likely that this would occur at the expense of imports, with some growth in steel usage also occurring.

One other possible problem in the forecast is the assumed productivity in the integrated sector. This sector has not achieved this rate of productivity growth in any of its basic products since 1964. If integrated firms cannot improve this rapidly, then imports and minimills will take larger market shares and employment will likely be even lower.

Summary of Causes

Steel is truly a global industry today. Higher productivity, lower wages, and lower raw material costs make a number of newly industrialized nations, along with Japan, highly efficient competitors. While competition is increasing, global steel demand is sluggish at best and may even be declining in the industrialized nations. The high value of the U.S. dollar is a contributor to domestic steel's recent difficulties but the problems facing American integrated steelmakers will not be completely erased by a weaker dollar. Cries for the government to "do something" generally ignore the contribution of federal fiscal policy—triple digit deficits—to trade problems. Most of the solutions to "Big Steel's" problems, however, require adjustments by the industry itself.

A weaker dollar will not erase the cost advantages enjoyed by Japan and the Newly Industrialized Countries.

Problems with the Solutions

As mentioned at the outset of this report, the industry desired the federal government to help by instituting a quota of 15 percent on steel imports. Instead the President decided to have U.S. Trade Representative William Brock negotiate voluntary export restraints (VERs), with the newly industrialized countries limiting steel imports to 18.5 percent of the domestic market. This is an approach similar to the "voluntary" restraints obtained from Japan for the U.S. auto industry. The threat of more draconian measures being applied by the Congress enhances the executive branch's ability to negotiate with the "offending" export nations.

There is some doubt that Mr. Brock's negotiations will be able to cap steel imports at the desired 18.5 percent level. The more important issue, however, is whether VERs will do more good than harm for the U.S. economy. The following analysis indicates that the economic costs of export restraints far exceed the benefits. In the long run, even the industry, its owners and its employees will suffer from applying the wrong solution to Big Steel's problems.

Effects of Earlier Trade Protection

This is not the first time that the American steel industry has applied for protection from imports. In 1959, during a long steel strike, the U.S. first became a net importer of steel. By 1968, imports reached 18 percent of domestic consumption. To forestall congressional action, the Japanese and EEC industries agreed to a three-year Voluntary Export Restraint (VER) limiting imports to 4.75 million tons each in 1969, with an allowed 5 percent growth a year thereafter. With this quantity restriction in place, enforced by the foreign governments, imports fell in 1969.

The Japanese and EEC firms reacted by raising prices and exporting higher value products. The immediate result in 1969 was that imported tonnage fell 23 percent but its value declined by only 11 percent.[35] In particular, imports of higher-priced, specialty steel rose 57 percent (measured in tonnage) over the next two years. Furthermore, non-quota countries—such as the United Kingdom, Korea, Brazil and Spain—began to develop their steel industries to supply the lower grades of the U.S. steel market.

The unsatisfactory results of the first VER brought about a much more detailed agreement in 1972, adding the U.K., and explicitly limiting specialty steels imports.[36] By 1974, that agreement became less important as world steel prices rose well above U.S. prices.

The worldwide steel shortage in the mid-1970s created a short-lived euphoria, but it led American steel firms to offer the Experimental Negotiating Agreement (ENA) during collective bargaining in 1974. The ENA guaranteed a three percent wage growth on top of a cost of living adjustment of two-thirds to three-fourths of the Consumer Price Index in exchange for a no-strike commitment. This, then, became the base for the next round of negotiations in 1977.[37] The inflation of the 1970s and the ENA together caused the massive runup in steel wages discussed previously.

The Carter Administration tries trigger pricing. The 1975 world recession led to a steel crisis. By early 1977, imports again reached an 18 percent share of the U.S. market. The industry initiated several antidumping suits against a number of the major exporting nations. The Carter Administration responded with the Trigger Price Mechanism (TPM). The TPM defines a "trigger price" or price floor for imported steel. Sales at prices below this level would be considered dumping. The trigger price was to be based on the costs of the lowest cost producer (Japan) plus an 8 percent profit on sales. The domestic industry hoped that this would limit imports to a 15 percent share as well as provide a price floor for its products. This system lasted, with a brief interruption, until the early part of the Reagan Administration.

The results from all of these efforts to protect the American steel industry were predictably disappointing. The industry raised its prices; steel prices rose 33 percent faster than all industrial products during 1970-1977. The union succeeded in raising wages, and the U.S. ended the decade behind the Japanese technologically.[38] Kiers has said of the TPM that it was "no way to attain efficiency or to increase productivity. . . [It] mitigated the effect without curing the cause"—an epithet which applies in general to protectionism.[39]

The Consumer Pays a Hidden Tax for Quotas

How would the current proposal for quotas on steel imports affect American consumers? A recent analysis by the Congressional Budget Office (CBO) projects the effects of a 15 percent import ceiling on the U.S. steel industry and the public. The CBO's analysis shows steel prices rising by 8.9 percent above what they would otherwise be in 1985.[40] This higher price would reduce domestic steel demand by 4.1 percent; however, the reduced import share results in a net increase in domestic shipments of 5.7 percent. Domestic steel employment would rise by 5.8 percent or 23,000 jobs. The increased profits and jobs are the advertised benefits, but what are the costs?

The CBO report estimates the costs of the program to the consumer as averaging $4.3 billion a year (in 1983 dollars); $1.7 billion of this amount would actually flow to *foreign* producers[41] (see Table 8). Foreign producers benefit

Table 8

ESTIMATED COST TO CONSUMERS OF A 15 PERCENT QUOTA ON STEEL IMPORTS

(billions of 1983 dollars)

Year	Income Transferred to Domestic Producers	Income Transferred to Foreign Producers	Total Cost To Consumers
1985	1.5	2.1	3.6
1986	2.3	1.8	4.1
1987	2.5	1.5	4.0
1988	3.0	1.6	4.6
1989	3.4	1.7	5.1
Average	2.5	1.7	4.3

Source: Congressional Budget Office

because the import quotas would give them free, though limited access to, what would become higher prices in the protected U.S. steel market. The benefits to foreign steel producers would be generated in the same way as they are for Japanese automakers. A VER on autos was negotiated to begin in April, 1981, and extended through March, 1985. Recently, Mori Matsumoto, a Japanese securities firm vice-president, reported that Japanese auto firms had record profits on almost static sales. Most interesting was his statement that 80 percent of their profits was due to exports to the U.S., even though this represented less than 20 percent of sales by units.[42]

Steel quotas would cost consumers about $189,000 (in the form of higher prices) for each job saved, making this one of the most expensive job creation programs ever conceived by the U.S. Congress.

Over the 1985-1989 period as a whole, the CBO estimates that 26,000 steelworker jobs would be protected, costing consumers about $189,000 (in the form of higher prices) for each job saved. This makes quotas one of the most expensive job creation programs ever conceived by the U.S. Congress.

Steel's Gains are the Steel-Users' Losses

Other costs of steel import quotas to the U.S. economy have received little attention thus far. U.S. industries that use steel would suffer employment losses greater than steel's gains! Higher steel prices in the U.S. would tilt the global "playing field" against these domestic industries. Both the CBO and Trade Representative Brock have alluded to this effect but have not been able to satisfactorily document it.

While it is difficult to provide a precise figure for employment effects in the steel-using sectors it is possible to calculate an approximate estimate.[43] In this calculation the responsiveness of demand in each manufacturing sector to an increase in the price of steel is estimated in a manner consistent with the overall decline in demand projected by CBO. If production cutbacks are assumed to take place in the most efficient firms— those with labor productivity of 25 percent above the average—a conservative estimate of employment effects can be obtained. For example, a 10 percent drop in output of transportation equipment (SIC 37) would translate to only a 7.5 percent reduction in employment in this sector. Assuming that all manufacturing industries face demand curves that have the same price elasticity, a 15 percent import quota, inducing an 8.9 percent increase in price, would result in a loss of 93,000 jobs in steel-using sectors. Thus, even taking into account the 26,000 steelworker jobs that would be "saved," the imposition of an import quota would result in a net loss of 67,000 jobs in the American workforce (see Table 9). Most of the job losses would be concentrated in metal fabrication, nonelectrical and electrical machinery, and transportation equipment (SIC 34-37), which are the major steel-using sectors in manufacturing.

These estimates are imprecise but, nonetheless, they make it clear that the job loss in steel-using sectors would exceed by a wide margin the number of jobs protected in the steel industry itself. The end result of the proposed steel import quota would be an estimated net job loss plus a cost to consumers of almost $5 billion a year! To add insult to injury, one-third of the dollars taken out of the pockets of consumers and employees in steel-using industries would go to foreign steel firms.

Summary

The popularity of import quotas as a policy remedy for the steel industry's problems does not imply that they will produce economic benefits that will outweigh costs. Quotas have a great deal of political charm whether or not they make good economic sense. Import restraints do demonstrate to steel industry employees and others with a major economic stake in steel that the federal government is "doing something" for them. The costs, meanwhile, are more widely dispersed among consumers and employees in steel-using sectors. Ultimately—but almost invisibly—import restraints do not even benefit the steel industry itself as they temporarily insulate it from the rigors of international competition that would otherwise force labor and management to adopt practices that would reduce costs, increase productivity, and otherwise enhance the industry's ability to meet foreign competition.

> *A 15 percent import quota would induce an 8.9 percent increase in the price of steel and a loss of 93,000 jobs in steel-importing sectors. Thus, even taking into account the 26,000 steelworker jobs that would be saved, a quota would result in a net loss of 67,000 jobs in the American workforce.*

Addressing Steel Industry Realities

What can or should be done for the American steel industry? Are there policy options that government should exercise to enhance its ability to compete or to facilitate adjustment to the surplus in worldwide steel making capacity? These questions face every industrialized nation, including Japan.

"Do It Yourself" Fixes Needed in Integrated Steel

The future for steel production in the United States appears to be in two areas: 1) our inland integrated steel mills centered in Chicago and the Great Lakes, which now represent over half of our integrated steel capacity;[44] and 2) minimills, whose expanding product range and cost effectiveness will provide rapid growth for at least another fifteen years. The Chicago-based mills have considerable geographic advantages. Rail transport and Great Lakes shipping costs raise the delivered cost of foreign steel sufficiently that this part of integrated steel should be able to service close-at-hand steel-using industries in a competitive fashion. While the high dollar exchange rate has enabled some foreign steel to be price-competitive in the north central U.S., it would take only a small drop in the value of the dollar to price most foreign steel out of this market as well.

Table 9

LOSS OF JOBS IN STEEL-USING INDUSTRIES DUE TO A 15 PERCENT STEEL IMPORT QUOTA

Sector (S.I.C. number)	Steel Coefficient (1979)	Employment in thousands (1984)	Sales in $ billions (1984)	Employment Effect of a 15% Quota in thousands
Food and kindred products (20)	0.02156	1622	156.4	– 2.1
Tobacco products (21)	0.00565	68	112.1	—
Textile mill products (22)	0.01123	743	140.8	– 0.5
Apparel products (23)	0.01472	1164	—	– 1.0
Paper products (26)	0.019789	661	164.3	– 0.8
Printing and publishing (27)	0.00978	1295	152.5	– 0.7
Chemical products (28)	0.02108	1046	215	– 1.3
Petroleum and coal products (29)	0.01139	195	120.3	– 0.1
Rubber and plastic products (30)	0.0282	718	219.9	– 1.2
Leather products (31)	0.01733	207	61.9	– 0.2
Lumber products (24)	0.03385	657	137.2	– 1.3
Furniture and fixtures (25)	0.12325	446	170.5	– 3.2
Clay, glass and stone products (32)	0.0228	572	143.4	– 0.8
Fabricated metal products (34)	0.330071	1373	120.2	– 26.7
Nonelectrical machinery (35)	0.14103	2038	150.6	– 16.9
Electrical machinery (36)	0.12137	2023	185.5	– 14.5
Transportation equipment (37)	0.18442	1756	117.8	– 19.5
Instruments (38)	0.05508	694	158.7	– 2.3
Total		17278	2527.1	– 93.1

Source: Department of Commerce

The National Defense "Red Herring"

Some supporters of protection for the steel industry have raised the spectre of fortress America, cut off from its foreign sources of steel, unable to fight a conventional war. The likelihood of such an event is beyond the scope of economic analysis. However, a brief review of steel needs in recent conventional wars will help provide some perspective.

The most recent conventional war, the Vietnam conflict, used a maximum of 2.2 percent of our domestic steel production.[45] During World War II, some 40 percent of total steel shipments were used in direct military uses plus construction. This amounted to a peak of 25 million tons in 1943. Today, automotive and other consumer uses of steel constitute around 20 million tons. In addition, construction demand requires another 10 million tons.[46] This represents 44 percent of domestic shipments to direct users. If automobile, appliance and some construction steel shipments were redirected to defense uses, as in World War II, our current steel industry would have little difficulty in supporting an effort of World War II proportions, the largest in our history.

It might be difficult to produce ships in the volume attained between 1940 to 1945. However, the low current level of U.S. shipbuilding is of greater concern than the availability of steel plate production. Cargo aircraft using very different materials would likely replace some of the transport functions previously carried out by ships. Finally, a conventional conflict with any nation other than Soviet Union should not hamper U.S. access to the ship-building countries of Japan and Korea.

Even if one believes that the United States would be unable to produce some types of steel products believed to be essential in an emergency, the best solution would not be trade protection. An open, honest, and carefully targeted production subsidy would be a less costly solution.

Many of the changes needed to make the American integrated steel industry more competitive are rather mundane. Steel producers need to emphasize quality while chipping away at costs and making productivity improvements. As Crandall, and Barnett and Schorsch have shown, investment in new capacity, and even rounding-out existing mills, will be much less productive than focusing on incremental process changes that cut costs. Improvements in labor-management relations are essential for the industry to take advantage of process improvements that production workers usually see best. Structuring incentives to induce workers to come forward with these "learning-by-doing" improvements is essential—workers who fear that higher productivity will cost them their jobs will not do their utmost to increase productivity. This is an area where we would do well to copy the Japanese. Steel firms in Japan have enjoyed success in harnessing the knowledge of production workers to help cut costs and improve working conditions and job safety.

Improvements in labor-management relations are essential for the industry to take advantage of process improvements that production workers usually see best.

The newly-formed, employee-owned Weirton Steel Company furnishes an example of the potential for such worker-management relations. To consummate the Employee Stock Ownership Plan buy-out from National Steel, the non-USW union agreed to a 20-30 percent reduction in hourly compensation. In addition to these wage concessions there have been efforts made to improve the previously adversarial approach to worker-management relations. The goal of mobilizing the workers to promote process improvements and lower costs has already met with some success—one "employee participation group" (akin to a Japanese quality circle) made suggestions that halved monthly maintenance costs on their blast furnace. The firm is currently earning a $41/ton operating profit versus breakeven results for most other integrated mills.[47] The wage cuts and favorable terms on their long-term debt have helped produce this profit so far, but longer run success will depend critically on continuing the worker-proposed process improvements.

The integrated producers will need to continue their focus on products for which they have a comparative advantage—particularly sheet steel, plates, large structural shapes, and large diameter tubes. Geographic trends are likely to continue in steel making production. Even in 1978, over half of the total U.S. steel production was already located around Chicago (the Great Lakes) and only 20 percent was in Pennsylvania.[48] With the recent plant closings in Pennsylvania, Indiana and Ohio are now the largest steel-making states with Illinois and Michigan closing in on Pennsylvania.

The best thing that Washington policymakers can do to facilitate the retrenchment and process changes needed in the steel industry is to continue some form of the investment tax credit that improves the return on investment in new equipment. State governments should avoid plant closing bills that *attempt to repeal market realities by legislative fiat.* These "capture" bills would make it unattractive for new industry to locate in these states thus making reemployment less likely. *In addition, antitrust policy needs to recognize global markets.* The furor raised over the Republic/LTV merger was overblown considering the international competitive situation.

Healthy Minimills

Furthermore, we must realize that not all steel producers are in decline. U.S. minimills appear to be able to outcompete domestic and foreign integrated mills for some types of steel products. This has happened already in wire rods, small structural shapes and concrete reinforcing bars. Minimills are now beginning to make inroads in large structural shapes, hot rolled bars, and seamless tubes. The U.S. comparative advantage in scrap availability has made it the largest minimill market in the world. Many of the early mills in the U.S., as well as some of the most recently built, are Canadian-owned. This technology export from Canada to the United States represents a typical international market reaction that utilizes the comparative advantage of each nation. When U.S. Steel tried to go against this trend by making a large investment in a wire rod mill at its integrated South Chicago Works during the early 1970s, it could not compete in spite of the most advanced technology.[49]

Global Steel Market

It is essential to grasp the fundamental change in international comparative advantage which is now taking place. Reduced shipping costs have brought all nations closer together, especially their coastal areas. This helped Japan during the 1960s and 1970s to become a world leader in steel. From the late 1970s on, however, a new force has become important. The development of turnkey steel plants has enabled many newly industrialized countries to acquire the most modern steel technology and to produce steel more cheaply than Japan.

The problems of Japan, with its coastal industrial regions, are great in its attempt to compete with NICs. Building integrated steel capacity in Japan is no longer profitable. In fact, it appears to be profitable only in the low-wage economies of the industrializing world. The NICs are now substituting domestic production of steel for imports from the industrialized economies and are also exporting to both less-developed and developed countries. In basic integrated steel mill products, these newly industrialized nations are the low cost producers. Japan cannot compete, nor can Europe or the U.S. without massive subsidies. Europe's long experience with steel and coal subsidies suggest that infusion of government funds is no remedy.

Quotas are not an appropriate response to these subsidies, however. The Administration has the authority to use compensatory tariffs to address this issue. Though tariffs will raise prices to the American consumer they also act as incentives for competitors to seek cost-saving measures to restore a price advantage. Quotas, on the other hand, reduce incentives to innovate since profits are not being squeezed by lower prices.

Moreover, the extent of foreign subsidies and dumping below cost is greatly exaggerated by steel industry spokespersons in order to justify quotas. For instance, there have been publicly made claims that foreign steel firms, such as Korea and Brazil, receive huge subsidies, amounting to 50 percent of costs. The facts, however, differ substantially from these claims. The Korean subsidy has been settled by the ITC which rejected the industry's exaggerated claims and determined the presence of a 2.2 percent government subsidy.[50]

A similar result occurred in the often-cited *Gilmore* case in 1977. Here a Japanese exporter of steel plates was accused of dumping steel at 32 percent below cost. All antidumping duty was levied. American users of this steel began complaining that domestic suppliers were unable to produce the same quality product. In the final analysis, ITC determined that the extent of dumping amounted to only 7.9 percent below cost.[51] The reality and the rhetoric about subsidies and dumping are often at wide variance.

The greatest subsidy to foreign steel producers comes from the rapid run up in the value of the dollar during the past four years. Some economists discount a linkage between federal government deficits, interest rates, and exchange rates. However, many others, including the last two Chairmen of the Council of Economic Advisers, Murray L. Weidenbaum and Martin S. Feldstein, have pointed the finger at $200 billion a year deficits as an important contributor to the trade deficit problem. *It would seem that of all the possible policy responses available to Washington, reducing the deficit is one that they should best be able to address. There is a way—comprehensive budget cutting—but is there a will?*

To the extent that trade negotiations would be helpful in sorting out unfair trade practices—subsidies and quotas—they should be multilateral. Perhaps the current worldwide economic recovery would be an opportune time to attempt a new round of GATT (General Agreement on Tariffs and Trade) talks. Absent this multilateral approach, we are in danger of returning to a "beggar-thy-neighbor" approach to trade relations reminiscent of the Great Depression.

Japan's response, along with that of Canada's minimill technology, has been the most creative. Japan has chosen a new area of comparative advantage, where its skilled people can still outcompete the NICs. It is in large and technically complex construction work and modern machinery that the developed world possesses important and continuing advantages. Building turnkey plants in the less developed world will continue to be a profitable and growing market for some time to come.

Meanwhile, in the United States, the bright future for minimills will not do much to offset the decline in steel industry employment. There is little comfort in knowing that all the industrialized countries face this same problem. In fact, it is realistic to expect that productivity enhancements needed to effectively compete may, themselves, lead to some further declines in employment. A high-wage economy's comparative advantage is not in mature industries which must compete with low wage nations. Rather, it lies in new and growing areas, where highly skilled people are needed to keep pace with rapid technological change.

If Congress believes that the federal taxpayers should ease adjustments for individual steel industry employees, it behooves the lawmakers to institute programs for retraining and relocation assistance, with as many market incentives as possible. Quite simply, the more market-oriented these approaches, the more likely they are to succeed. Robert Reich has proposed the substitution of retraining assistance for long-term unemployment payments. Perhaps a voucher system providing tax credits to an employer who aids in this transition would enhance the chances of meaningful reemployment.

Rather than preserve an industrial museum, we should allow the retrenchment of the integrated steel sector into the products and locations in which it can compete effectively.

The most dangerous public policy course is the one that this country appears to be embarking upon—reliance on import restraints. Protecting the steel industry at the expense of American steel-using industries is counterproductive. The net loss in jobs from this strategy could exceed 67,000 jobs. Rather than preserve an industrial museum, we should allow the retrenchment of the integrated steel sector into the products and locations in which it can effectively compete. The absolute size of that competitive domestic steel sector will depend, in good measure, on actions taken by the management and labor of the steel producers.

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2.2

Reforming Regulation of Hazardous Waste

by Ronald J. Penoyer

CENTER FOR THE STUDY OF AMERICAN BUSINESS

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Preface

This report takes a broad and dispassionate look at one of today's most controversial public policy issues — the management of hazardous wastes. Public response to several highly publicized instances of environmental contamination has often been impassioned The resultant Congressional action has reflected the drama of the situation more than the technical problems that must be solved.

The purpose of this report is two-fold: to acquaint the reader with the basic features of the laws regulating hazardous waste, and to suggest improvements in federal activities in order to remedy or alleviate serious waste problems.

In a larger sense, this study attempts to defuse the highly emotional aspects of hazardous waste disposal and analyze the issue as objectively as possible. Its conclusions are straightforward. The problem is complex and the costs involved are huge; hence, the statutes governing hazardous waste need to be both reasonable and flexible.

More fundamentally, unless the American public is prepared to make major and difficult changes in the way in which we produce and consume, the generation of hazardous wastes will continue to present difficult environmental problems.

Murray L. Weidenbaum, Director
Center for the Study of
American Business

Introduction

The disposal and cleanup of hazardous waste is one of the nation's most pressing environmental problems. Public opinion on hazardous waste sites is clear and straightforward: people do not want to live near them, they do not want the environment threatened by them, and they want hazardous sites cleaned up

This report examines the hazardous waste disposal problem in the U.S., focusing on the two major federal laws regulating how those wastes are generated, stored, transported, treated or disposed of, and cleaned up. On that basis, specific recommendations are made for changes in regulatory policies and practices

Part One analyzes the basic issues in the generation and disposal of hazardous wastes. *Part Two* treats the other end of the problem — cleanup of hazardous waste sites that pose a threat to human health and the environment *Part Three* presents recommendations for a) changes in the basic laws regulating disposal and cleanup, and b) further actions by government and industry.

Federal Laws Regulating Hazardous Wastes

As shown in Table 1, the federal government maintains detailed regulatory control over hazardous and toxic substances. A total of 22 laws govern their use, handling, and disposal. The definition of hazardous or toxic is extremely broad. For example, it includes petroleum products, one of the most common and essential substances in American life.

Two major federal statutes govern hazardous waste. The law controlling the generation, transportation, storage, and disposal of hazardous wastes at existing (or future) waste facilities is the Resource Conservation and Recovery Act of 1976, known as RCRA. RCRA deals with operating facilities, not with closed or abandoned sites. The law provides for: 1) federal classification of hazardous waste; 2) a "cradle-to-grave" manifest (tracking) system for wastes; 3) federal safeguard standards for generators and transporters, and for facilities that treat, store, or dispose of hazardous wastes; 4) enforcement of standards for facilities through a permitting system; and 5) authorization of state programs to replace federal programs. RCRA's basic purpose is to protect groundwater from toxic pollution.

A second law, the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), known as the "Superfund," has different objectives. It authorizes the federal government to take action to remove hazardous substances from active and inactive disposal sites that are dangerous, and to clean up emergency spill situations. CERCLA imposes liability for cleanup on companies whose wastes have contaminated a disposal site. Title II of the

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law established a Hazardous Substance Response Trust Fund ("Superfund"), financed by taxes on crude oil, certain imported petroleum products, 42 chemical "feedstocks" produced by manufacturers, and general revenues from the government. The fund currently stands at $1.6 billion. The House of Representatives has proposed raising an additional $10.2 billion over the next five years. Both this law and RCRA give the Environmental Protection Agency (EPA) broad regulatory and standard-setting powers.[1]

Table 1

FEDERAL LAWS REGULATING HAZARDOUS AND TOXIC WASTES OR SUBSTANCES

Statute	Section of U.S. Code
Comprehensive Environmental Response, Compensation, and Liability Act	42 U.S.C. 9601
Resource Conservation and Recovery Act	42 U.S.C. 6901
Toxic Substances Control Act	15 U.S.C. 2601
Clean Water Act	33 U.S.C. 1251
Clean Air Act	42 U.S.C. 7401
Safe Drinking Water Act	42 U.S.C. 300(f)
Federal Insecticide, Fungicide, and Rodenticide Act	7 U.S.C. 136
Consumer Product Safety Act	15 U.S.C. 2051
Occupational Safety and Health Act	29 U.S.C. 651
Hazardous Materials Transportation Act	49 U.S.C. 1801
Federal Hazardous Substances Act	15 U.S.C. 1261
Uranium Mill Tailings Radiation Control Act	42 U.S.C. 7901
Federal Food, Drug, and Cosmetic Act	21 U.S.C. 301
Poison Prevention Packaging Act	15 U.S.C. 1471
Lead-Based Paint Poisoning Prevention Act	42 U.S.C. 4801
Federal Disaster Relief Act	42 U.S.C. 5121
Marine Protection, Research, and Sanctuaries Act*	33 U.S.C. 1401
Deepwater Ports Act*	33 U.S.C. 1501
Outer Continental Shelf Lands Act*	43 U.S.C. 1801
Intervention on the High Seas Act*	33 U.S.C. 1471
Trans-Alaska Pipeline Act*	43 U.S.C. 1651
Ports and Waterways Safety Act*	33 U.S.C. 1221

Source: U.S. Code.

*Note: These statutes relate primarily to oil as a hazardous substance.

PART ONE: GENERATION AND DISPOSAL OF HAZARDOUS WASTE

The Complexity of the Problem

A 1981 study by the General Accounting Office acknowledged that "the real and potential problems posed by improperly managed hazardous waste sites are enormous." It stated that the problem constitutes "perhaps the single most important environmental issue of the decade."[2] The issues inherent in generating, managing, and disposing hazardous wastes are complex and diverse. This section attempts to clarify some of them.

What are "Hazardous Wastes"?

In a legal sense, the definition of "hazardous waste" in RCRA (42 USC 6901(5)) is very broad. It states that hazardous waste is

> . . .a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics, may (a) cause, or significantly contribute to an increase in mortality or. . .illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

This definition is complicated by two factors. First, regulations issued by EPA under RCRA include waste substances that are either liquid or contained in liquids. Most hazardous waste is, in fact, wastewater. Though the operative term in the definition is "solid waste," the definition covers materials that are liquid, semi-solid, solid, or that contain gaseous material. Second, the definition of "improper management" poses special problems. As John Quarles, former general counsel and assistant administrator of EPA, has written, "the implications of basing the definition. . .upon the assumption of improper management. . .leads inevitably to an expansion of jurisdictional coverage." The term "has indeed embraced a broad array of waste materials that differ markedly from each other in their hazard-producing potential."[3]

Identifying materials classified as "hazardous waste" is a complicated process. The basic characteristics are 1) any type of garbage, sludge, or refuse; or 2) material that is discarded or has served its intended purpose as a manufacturing or mining by-product. These substances are either: a) ignitable, reactive, corrosive, or toxic; or b) materials that have been listed by EPA as hazardous waste. The EPA has issued four lists of roughly 400 substances classified as hazardous wastes.[4] There are believed to be hundreds, if not thousands, more materials which could be classified as hazardous according to the above criteria.

Sources of Hazardous Wastes

Almost all aspects of economic activity generate hazardous (or potentially hazardous) wastes—agriculture, industry, government agencies, and consumers. The largest source is various kinds of manufacturing, ranging from food, textile, and lumber production to the manufacture of paper, machinery, and instruments. (See Table 2 for waste estimates of the industrial sector.) The

Table 2

ESTIMATED SOURCES OF INDUSTRIAL HAZARDOUS WASTE

Industrial Source (S.I.C. number)	Percent of total
Chemicals(28)	68
Nonelectrical Machinery(35)	10
Transportation Equipment(37)	6
Metal Related Industries(33,34,36)*	6
Motor Freight Transportation and Warehousing(42)	4
Petroleum and Coal Products(29)	3
All others	3
Total	100

Source: Westat, Inc., *National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities Regulated under RCRA in 1981*, 1984.

Note: *Includes Primary Metals, Metal Products and Electrical Equipment.

largest single source of waste designated as hazardous is the production of chemicals and allied products. Manufacturing wastes include heavy metals (e.g., mercury, arsenic, cadmium), dyestuffs, residual organics, solvents (e.g., acetone, methanol), particulates (e.g., metal oxides), pigments, oils, and contaminated petroleum distillates.

Other sources of hazardous waste are a) end-use activities, b) unusable, unneeded, or unwanted products, c) wastewater treatment sludges, and d) transportation-related spills. Substances in these categories include unused residual products (e.g., pesticides and their containers), drycleaning fluid, electrical equipment containing hazardous materials, emission control sludges, and acids.[3]

Management of Hazardous Wastes

Management methods for hazardous wastes are also quite varied. The diversity of wastes requires a variety of handling methods. The basic management practices are the following:

1) *Storage* (at least temporarily) in tanks or other containers, lagoons, or other facilities. The nature and quantity of the waste governs how, and for how long, it is stored.

2) *Various kinds of treatment:* a) physical treatment, as in filtration; b) chemical treatment, to change molecular structures; c) biological treatment, causing decomposition; or d) high-temperature thermal treatment, or incineration, of appropriate substances. Incineration is technically a treatment method, though it results in material (ash) that must be disposed of.

3) Methods of *disposal,* which include: a) surface impoundment in pits,

ponds, lagoons, etc.; b) landfills where wastes are placed directly in the ground; c) land treatment, or landfarming, by which wastes are spread and mixed so as to be rendered innocuous; and d) deep well injection. Additional methods are waste piles and ocean dumping. Illegitimate or illegal methods of waste disposal include "midnight dumping" of hazardous substances and road application of wastes mixed with oil. Blending of wastes with heating fuel is now being brought under regulation.

Many treatment and disposal methods are available. The methods chosen depend on the specific kind of material being handled.[6] Table 3 shows the wide range of costs for different methods of waste disposal.

By the end of 1981, about 10,000 hazardous waste storage, treatment, and disposal facilities had reported their activities to EPA. Almost 90 percent of these were treatment and storage sites, but only 13 percent of them (about 1,267) had some disposal capability. A large majority of the facilities use containers or tanks to treat or store waste. About 17 percent use surface impoundments, 6 percent use incineration, and 5 percent use landfills.[7]

Table 3

COSTS OF ENVIRONMENTALLY SOUND METHODS OF HAZARDOUS WASTE DISPOSAL

Method	Cost (dollars per metric ton)
Land spreading	$2-25
Chemical fixation	5-500
Surface impoundment	14-180
Secure chemical landfill	50-400
Incineration (land-based)	75-2,000
Physical, chemical, or biological treatment	Varies

Source: Office of Water and Waste Management, Environmental Protection Agency, *Everybody's Problem: Hazardous Waste,* 1980.

According to EPA, approximately 80 percent of the total volume of waste produced by industry in the U.S. is stored and disposed of by manufacturers at their own factory sites. Most non-industrial generators transport their wastes to commercial disposal and treatment facilities, most of which are landfills. Eighty percent of waste producers ship their wastes to commerical sites, and most of this waste comes from small generators.[8]

The Scope of the Environmental Threat

Millions of metric tons of industrial waste are produced in the U.S. every year. Estimates of the actual quantity generated are not very precise, however. For example, according to an April 1984 study commissioned by EPA, the estimated quantity of hazardous wastes generated in 1981 falls within a wide range — between 133 and 395 million metric tons. Despite this uncertainty, the same study holds that the quantities of hazardous wastes generated are greater than previously estimated.[9]

Most hazardous waste is not destroyed; it is merely stored. However, a threat to human health is posed only when hazardous waste is improperly managed or when failures occur at storage or disposal sites.

The most widely used methods of storage, treatment, and disposal of hazardous wastes inherently pose dangers to human health and the environment, simply because they do not actually destroy the wastes. Instead, in most cases, wastes are essentially stored. However, a threat is posed only when hazardous waste is improperly managed or when failures occur at storage or disposal sites.

According to the most recent data, EPA has identified 18,000 potentially hazardous waste sites, and it expects ultimately to find 22,000. Some 10,000 have been assessed, and of those, approximately 3,900 require further investigation. EPA placed 538 of the major disposal sites on its National Priority List of hazardous sites, qualifying them for federal assistance for cleanup. In October 1984, EPA proposed placing another 244 sites on the list (some of them federal facilities), to bring the total number of sites requiring attention to 782.[10]

Groundwater Contamination

The most serious threat posed to human health and the environment by hazardous wastes is contamination of groundwater (i.e., subsurface water in aquifers). RCRA is designed primarily to protect this natural resource. Several important features of groundwater are relevant. First, the supply of groundwater in the U.S. is vast—an estimated 33 to 59 quadrillion gallons. Second, the importance of groundwater as a source of drinking water or for industrial and agricultural uses varies geographically. Third, most groundwater moves very slowly, typically at a rate of twenty or thirty feet per year. Its slow movement presents both an advantage and a disadvantage in the event of contamination by wastes: a) one part of an aquifer may be polluted while another part is completely untouched, and b) the slow but steady dispersal of a "plume" of contaminants in groundwater means that an aquifer, once polluted, is likely to remain that way a very long time.

Fourth, knowledge about groundwater is limited, even among experts. Popular understanding of groundwater, therefore, and of the health threat posed by contaminated water, is even more limited. Fifth, pollution of groundwater is more likely to occur from sources other than direct industrial generation. These sources can include contamination by agricultural chemicals, septic tanks, mining operations, highway de-icing salts, and even natural causes.

Finally, testing and monitoring groundwater is both difficult and costly because concentrations measured in only parts per billion may be unacceptable for some contaminants. In addition, remedial treatment of contaminated groundwater areas is a massive—and very expensive—undertaking that is hindered by the limitations of available technology for treatment.[11]

Once groundwater is contaminated by a pollutant, the problem is difficult to track. Movement of hazardous waste varies with the nature of the waste itself, soil conditions, weather, groundwater flow rate, and the method of containment. The Council on Environmental Quality has reported that wastes have seemed to remain fairly static in some places; elsewhere, they have moved as fast as two feet a day. In severe cases, the problem can be extraordinary. At a 39-year-old, 17-acre landfill at Islip, N.Y., a leachate plume of waste (leaking from the site) extended one mile, was 1,300 feet wide, and 170 feet deep. The material contaminated roughly 1 billion gallons of groundwater.[12]

The broad scope of the environmental problems concerning groundwater protection has been described by John Quarles in these terms:

> In dealing with problems of groundwater, environmental protection is facing a new frontier. The dynamics of contamination affecting this resource are totally different from those of surface water pollution, air pollution and most other environmental concerns upon which our entire understanding is based. . .We have barely scratched the surface of understanding what groundwater protection is all about.[13]

Major Provisions and Implementation of RCRA

The framework of RCRA provides for comprehensive regulation of hazardous wastes at both the federal and state levels. The law requires the identification and listing of wastes based on factors such as toxicity, persistence and degradability in nature, and the potential for accumulation in tissue. A brief overview of the law's main provisions follows.

Mandatory Standards

RCRA mandates the promulgation of standards for generators of hazardous wastes. Specific regulations cover recordkeeping, labels for containers, disclosure of chemical components, use of a manifest (tracking) system, and reporting to EPA. Similar standards apply to transporters of wastes, in conjunction with the Department of Transportation.

Performance standards are prescribed for owners and operators of waste treatment, storage, and disposal facilities. These standards distinguish between requirements for new and existing facilities and specifically include rules for recordkeeping, reporting, monitoring, inspection, design and construction of facilities, and compliance with permits for treatment, storage, and disposal.

Permitting actions taken by EPA through fiscal 1984 are shown in Table 4. Although the agency acknowledges that issuing permits for hazardous waste facilities is an enormous task, EPA hopes to complete the process by 1992.[14]

Table 4

PERMITTING OF HAZARDOUS WASTE FACILITIES THROUGH FISCAL 1984

Type of Facility	Called In	Issued
Storage and treatment	2274	307
Incinerators	207	16
Disposal facilities	904	13
Total	3385	336

Source: Office of Solid Waste, Environmental Protection Agency.

Permitting Process and Implementation

RCRA's permitting provisions are intended to guarantee that, eventually, all hazardous waste facilities will operate under conditions specified in the permit. However, a "grandfather" clause has allowed existing facilities to operate under "interim status" until a final permit is either issued or denied.[15]

Under rules issued in November 1980, firms and individuals that generate, store, treat, dispose of, or transport hazardous wastes are required to report to the EPA and obtain interim permits to continue operating. Generators are required to store and label wastes in tanks or drums that do not leak, and to keep records. Treatment and disposal facilities are required to plan to "cap" their sites (to prevent water seepage) when filled, provide funds to do this, develop emergency procedures, and monitor any nearby groundwater for possible contamination. Specific operating standards also apply to certain types of facilities. Transporters must prepare manifests for shipped wastes, label the wastes, and clean up any spills. Final standards for storage and treatment facilities were issued by EPA in January 1981; final rules specifically governing incineration facilities were not issued until June 1982; and land disposal permit applications were issued in January 1983, to be effective six months later.

The rules affecting waste storers and treaters require them to use tanks of a specified thickness. Incinerators, however, are under a more stringent requirement to remove 99.99 percent of hazardous wastes. The final rules for new landfills, issued by EPA in January 1983, have the greatest effect, since they require specific liners (made of clay and/or plastic) for these sites, collection systems for leaking waste, and monitoring systems. According to EPA, most surface impoundments of waste currently fail to meet these requirements.

By mid-1983, EPA had initiated the final permit process for less than 1,700 of an estimated 8,800 hazardous waste facilities.

EPA officials, recognizing the dimensions of the task, have estimated that it may take many years to inspect all the hazardous waste facilities that must receive final permits or go out of business. By mid-1983, the agency had initiated the final permit process for less than 1,700 of an estimated, potential total of over 8,800 hazardous waste facilities in the U.S. Nine permits had been granted to new facilities (which cannot be granted interim permits), and no land disposal or incinerator facilities then in operation had been given or denied final permits.

Delays are inherent in the RCRA permitting process. Waste operators, once they have been contacted by EPA, have six months to apply for permits and another 30 days to correct any "incompletions" that EPA identifies. After a public hearing, another 45 days is allowed for the agency to make a "tentative decision." EPA can then take as long as necessary to issue a final permit. [16]

State Programs

RCRA directs the Environmental Protection Agency to issue guidelines that assist the states in developing their own hazardous waste programs which, when equivalent to federal programs, operate in lieu of federal regulation. Under the Reagan Administration, EPA plans to delegate more of the handling of hazardous waste programs to the states. By 1982, a majority of states had received "interim authorization" for such programs. Until a state program is approved, a company must comply with both state and federal requirements for waste management. [17]

Inspection and Enforcement

EPA is authorized to inspect all hazardous waste handlers, including waste generators, transporters, and facilities where wastes are or have been stored. EPA can issue compliance orders and bring suit in U.S. District Courts in the event of violations of laws or regulations. Substantial civil and criminal penalties are also provided. EPA assessed $1.7 million in civil penalties in 1982.

Under amendments to RCRA in 1980, an unusually severe penalty for the offense of "knowing endangerment" was added. The provision provides sanctions against any person who knowingly "places another person in imminent danger of death or serious bodily injury" if the conduct shows "unjustifiable and inexcuseable disregard for human life" or an "extreme indifference for human life." A conviction for this offense can result in a fine of $1 million for a corporation and up to $250,000, plus imprisonment, for an individual. [18]

Summary

The basic features of RCRA are fairly straightforward, bearing little resemblance to the byzantine complexity of other laws such as the Clean Air Act or the Clean Water Act. This did not prevent, however, delays in carrying out the law.

First, unlike other environmental laws, efforts under RCRA to regulate the management of hazardous waste required that complex regulatory mechanisms had to be developed with very little precedent. There were no prior programs or frameworks from which to proceed. Second, technical and scientific problems have continued to hamper progress and generate debate. In the universe of chemicals and substances produced by industry, EPA and others had to identify those which may be considered "hazardous" — and then determine the *amounts* of those substances that would pose a threat to human health and the environment. Simply defining what is "hazardous" was and is a chore in itself.

Third, the scope of the hazardous waste problem in the U.S. was not fully understood. In many ways, knowledge is still deficient. The discussion of the complexities of groundwater is just one example of this lack of understanding. Another, to be discussed later, is the limited knowledge concerning the health effects of many substances. As a corollary, no reliable data exist as to which waste problems require the most serious regulatory attention.

Neither EPA nor any existing state agency possesses the expertise or the staffing to tackle the regulatory mandate thrust upon it by Congress.

Finally, neither EPA nor any existing state agency possesses the expertise or the staffing to tackle the regulatory mandate thrust upon it by Congress. The task expected of government, moreover, is formidable: to control, from cradle-to-grave, a vast number of substances produced by countless firms from coast to coast. The federal government was charged to do this under deadlines and through a thicket of litigation at almost every step of the way.[19]

The 1984 Amendments to RCRA

In spite of drawbacks in the basic law, during 1983 and 1984, both the House of Representatives and the Senate worked on amendments to RCRA that would make some aspects of the law more strict. A bill embracing these changes was passed in October 1984 and signed by the President in November 1984.

According to a 1983 House report, one of the primary reasons for action by Congress in reauthorizing RCRA was an estimate that "an amount of hazardous waste equal to that which is currently regulated under RCRA (40 million metric tons per year) is escaping control through various loopholes." The changes were also prompted by a growing desire to end or severely limit land-based disposal of wastes. As stated in the conference committee report on the final bill, Congress intended

> to convey a clear and unambiguous message to the regulated community and the Environmental Protection Agency: reliance on land disposal of hazardous waste has resulted in an unacceptable risk to human health and the environment . . .through the vigorous implementation of the objectives of this Act, land disposal will be eliminated for many wastes and minimized for all others, and . . .advanced treatment, recycling, incineration and other hazardous waste control technologies should replace land disposal.

In a larger sense, the amendments were also enacted as a reaction to the perceived failures of EPA during the Reagan Administration.[20]

Small Quantity Generators

In 1980, EPA conditionally excluded from regulation any generator of hazardous waste which generated less than 1,000 kilograms (one metric ton) of hazardous waste in a calendar month. The 1984 amendments to RCRA have limited that exclusion to generators producing less than 100 kilograms of waste each month. This amount is roughly one half of a 55 gallon drum. This provision affects an estimated 130,000 small generators in the U.S., including a wide variety of small businesses such as drycleaners and gas stations, as well as school science labs. EPA is required to develop regulations for this provision by March 31, 1986.

The new provision brings these businesses into the entire constellation of hazardous waste regulation, for it presupposes that these firms must identify any wastes they produce that fit the definition of "hazardous." It also imposes on them recordkeeping requirements, including the filing of manifest (tracking) reports which must be kept for three years after a disposal facility has received the waste.

It is likely that the small generator of hazardous waste will feel a substantial impact under this change, in terms of disposal and paperwork costs. It may also have the unfortunate result of encouraging some small generators to dispose of waste improperly if the trouble and costs involved become too great. Congress did recognize, however, that the EPA Administrator, in promulgating small-generator regulations, can be flexible in choosing among regulatory approaches as long as the regulations protect human health and the environment.

Land Disposal Restrictions

The most important and far-reaching sections of the RCRA amendments are those which attempt to phase out nearly all land disposal of hazardous wastes. Specific provisions are the following:

1) Prohibits landfill disposal of noncontainerized or bulk liquid hazardous waste.

2) Requires EPA to issue, within 6 months, regulations minimizing (to the extent technologically feasible) landfill disposal of containerized liquid hazardous wastes and to minimize the presence of free liquids in containers.

3) Prohibits landfill disposal of non-hazardous bulk liquids in permitted landfills.

4) Prohibits landfill disposal, within 32 months, of specified hazardous wastes. These specific wastes are the "California list" of high-priority, highly toxic materials.[21]

5) Prohibits landfill disposal, within 24 months, of hazardous wastes containing dioxin.

6) Requires EPA to issue, within 45 months, regulations on disposal of the "California list" wastes, dioxin, and solvents into deep injection wells. If EPA fails to do this in that time period, such disposal will be banned. Other provisions ban underground injection in any area within one-fourth of a mile

of an underground source of drinking water. (See section on "hammer" provisions, below.)

7) Failure of EPA to issue, within 66 months, regulations for any hazardous waste will automatically result in statutory prohibition of land disposal of all listed and identified hazardous wastes.

An obvious goal of these provisions is to prevent future problems with environmental contamination from land-based waste sites. An obvious drawback, however, is that the prohibited waste must go *somewhere* for treatment or disposal. It is likely that the restrictions will cause waste generators to attempt to have more substances incinerated. (Other methods include chemical neutralization and various means of deliquifying or solidifying the wastes.) A study by Arthur D. Little Associates indicates that incineration capacity will have to increase by a factor of six. In 1981, 1.7 million metric tons of hazardous waste were incinerated in the U.S.[22]

The difficulties associated with greatly expanding incineration facilities are far from trivial: 1) incineration is up to 10 times more costly than land disposal; 2) permitting of incinerators poses an obstacle, given regulatory requirements and customary delays—in fact, all current incineration facilities operate under interim permits; 3) public opposition is as strong against the siting of incineration facilities as it is against landfills; 4) incinerators are difficult to maintain properly and safely; and 5) questions arise concerning the environmental impact of air pollution from incinerators.

These provisions come at a time when there is already a significant shortage of safe, reliable waste disposal sites. No new disposal sites have been opened since 1980, and many old sites have been closed. Proposals to open new facilities in various parts of the country have met with strong public opposition.[23]

Minimum Technological Requirements (Retro-fitting)

A major provision of the RCRA amendments requires that all new landfills and surface impoundments of hazardous wastes must have double plastic liners and a leak-collection system, and provisions for groundwater monitoring. These "minimum technological requirements" increase disposal costs significantly. Existing surface impoundments of hazardous waste must comply with these requirements within four years. EPA can modify these rules but only after an operator of a facility meets stringent guidelines for an exemption.

The ramifications of this provision are enormous for the sites to which it applies. The bill does not offer guidance as to how a company should insert the liners and the collection systems under millions of tons of waste. The obvious solution appears to be to move the materials contained at an existing site to another new or existing site, at least temporarily. As stated above, existing facilities are in short supply and no new ones have been opened. Therefore, the retro-fitting requirement presents a serious dilemma. Moreover, most experts are not convinced that the plastic liners will not start leaking eventually.[24] The cost of these requirements is significant. The chemical industry has estimated the total retro-fit price tag at $5 billion.[25]

Burning and Blending of Hazardous Waste

Two minor provisions of the new amendments now regulate the blending of hazardous wastes with fuel oil or waste oil to prohibit uncontrolled disposal either by burning for heating purposes or for dust suppression.

The first of these problems came to light within the past four years, in New York and New Jersey. Partly as a result of higher disposal costs due to tighter regulation under RCRA, illegal wastes were blended with fuel oil as a surreptitious way of disposing of these wastes. Blending of wastes with heating oil has been extremely hard to track because of attempts to circumvent RCRA rules by falsifying manifests.[26] The second problem addressed in these provisions is the one which led to extensive dioxin contamination of soil at Times Beach, Missouri.

Waste Minimization

The amendments require that, as a condition for a RCRA permit as of September 1, 1985, a generator must certify annually a) that he has a program in place to reduce waste generated, to the extent economically practicable, and b) that the proposed method of treatment, storage, or disposal is the one currently available to him that minimizes the threat to human health and the environment. These items must also be certified on the shipping manifests of transported waste. Biennial reports of generators must indicate efforts to reduce the volume and toxicity of wastes and to report the reductions achieved.

The provision offers no guidance as to how generators can reduce the volume and toxicity of their wastes. It does, however, impose substantial new paperwork requirements.

Mandatory Inspections

The amendments require that every hazardous waste treatment, storage, or disposal facility that is required to have a permit must be inspected at least every two years. Allowance is made to explore the possibility of using private-sector inspection programs. This latter flexibility may be important, given the EPA's limited resources.

Underground Storage Tanks

The 1984 amendments mandate restrictions on the use of underground storage tanks, particularly "bare steel" tanks that provide little or no protection against corrosion. EPA must issue regulations for their installation that a) require leak detection systems, inventory control systems, or other methods to detect releases from underground tanks; b) specify tank closure procedures, and c) provide new tank standards and program regulations for all petroleum tanks within 30 months, new tank standards for the remaining regulated substances within 36 months, and new program regulations for the remaining substances within 48 months.

The scope of these regulations is enormous. The Conference Report on the amendments acknowledges that "there are approximately two million underground tanks in the country in which gasoline and other hazardous substances are stored." It states that "approximately 85 percent of these tanks are made of steel with no corrosion protection" and that, according to petroleum industry experts, "as many as 75,000 to 100,000 underground tanks are leaking and that 350,000 may develop leaks within the next five years."[21]

National Groundwater Commission

The new law also establishes a 19-member National Groundwater Commission and gives it the following duties: a) to evaluate the quality of the nation's groundwater, b) to identify the sources and extent of contamination, c) to assess the need for a groundwater protection policy, and d) to assess state and federal standards for groundwater quality and their ability to preserve and protect fresh water aquifers.

"Hammer" Provisions

Some unusual features of the RCRA amendments are stipulations, such as those mentioned under "Land Disposal Restrictions," stating that, if the EPA fails to issue certain regulations by specified dates, then disposal of wastes will be automatically and entirely prohibited after those dates. These stipulations, known as "hammer" provisions, are strong indications of congressional impatience with, and distrust of, EPA.

The drawbacks of the "hammer" provisions are substantial. First, they fail to recognize the human, technical, scientific, and logistic limitations of promulgating regulations, regardless of how large an agency's budget may be. Second, they inherently place private-sector waste generators and handlers in an unfair position: if the government fails to do the job mandated by Congress, then the private sector must suffer the consequences.

Summary

Regulation of hazardous waste treatment, storage, and disposal under RCRA is now an established fact. With the passage of the 1984 amendments, an expansion of existing regulatory programs has begun.

The industries most directly affected by RCRA have, for the most part, learned to live with its requirements as a "fact of life." Industry objections to the 1984 amendments include the following:

1) The "burden of proof" concept placed on EPA for determining whether land-based disposal of certain wastes is safe. If EPA cannot, or does not, make this determination and issue appropriate regulations, then "hammer" provisions go into effect to ban the land disposal of those wastes. In effect, EPA must prove a negative—that a given waste in a given disposal environment is proven safe. Such a determination by EPA will subject the agency to nearly certain court challenge;
2) The expensive—and difficult to implement—provision under "minimum technological requirements" to retro-fit existing landfill and impoundment facilities, whether or not the facility is leaking;
3) Unclear language in the law as to whether industry is allowed to use methods of disposal tailored to the specific type of waste being handled (i.e., whether landfill of a given waste is allowed while impoundment is prohibited);

4) The "hammer" provisions which institute automatic prohibition of various types of disposal.

Public opinion has emphasized the need for firm federal control of hazardous waste management. However, the analysis here suggests that major obstacles have not been overcome, particularly with regard to new restrictions on land disposal of wastes. Congress has failed to recognize the shortage of safe, reliable disposal facilities—but it has sought to virtually end the most common means of disposal. Unless the production of hazardous material itself is prohibited, the wastes that are an inherent by-product of modern life must be disposed of somewhere, somehow.

Congress has failed to recognize the shortage of safe, reliable disposal facilities—but it has legislated the virtual end of the most common means of disposal.

A former EPA official has characterized the well-intentioned methods of Congress in this way:

> One of the biggest problems we have is Congress writing laws which call for implementation deadlines for when regulations are to be implemented; but no one allows time either before the law is written or before the regulations have to be promulgated to study the problem and get the basic knowledge base established . . . In an effort to get the programs on the road, Congress shot itself in the foot.[28]

PART TWO: CLEANUP OF HAZARDOUS WASTE SITES

The regulatory apparatus of RCRA is geared almost entirely toward current and future management of hazardous wastes. Following several dramatic, highly publicized instances of citizen exposure to abandoned hazardous waste dumps in the late 1970s—particularly that of Love Canal at Niagara Falls, N.Y.— Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9601). This law has come to be known as "Superfund."

Under CERCLA, the federal government identifies active and inactive hazardous waste sites nationwide and is authorized to remove waste materials or otherwise take remedial action. This activity is financed by a Hazardous Substance Response Fund, funded by tax levies on oil and oil products, chemical "feedstocks," and general revenues. Over the 1980-1985 period, $1.6 billion will have been raised for Superfund.

Provisions of CERCLA

The law defines "hazardous substance" by incorporating definitions for substances listed in the following environmental statutes: the Clean Water Act, the Solid Waste Disposal Act (including RCRA), the Clean Air Act, and the Toxic Substances Control Act. CERCLA also directs EPA to issue regulations for other substances found to be hazardous when released into the environment. Moreover, EPA must also issue regulations establishing the *threshold quantity* or "reportable" quantity of a hazardous substance release that triggers notification and response under the law. Unless existing EPA regulations specify otherwise, the reportable quantity for a released hazardous substance is one pound.[29]

National Contingency Plan

CERCLA establishes a National Contingency Plan (NCP) which sets forth the procedures and methods to be followed in the event of a release of hazardous substances, pollutants, or contaminants. The procedures apply to the discovery, investigation, evaluation, and removal (where necessary) of hazardous materials. The NCP also includes requirements for analyzing the relative costs of cleanup; criteria for determining the appropriate extent of cleanup; determination of federal, state, and local roles; and means of assuring that the remedial action is cost-effective.

The scope of EPA's cleanup authority is very large, since the key terms in CERCLA—"hazardous substance," "pollutant and contaminant," and "remedial action" — are given broad statutory definitions. Once the agency is authorized to act and appropriate response actions are determined, EPA cannot spend more than $1 million on the cleanup or continue its activity for more than six months unless the affected state has agreed to pay 10 percent of the cleanup cost and has assured all future maintenance. EPA may also determine that removal of hazardous materials at a site, or other remedial action, should be undertaken by the parties responsible for the release of the substances, thereby avoiding costs to Superfund.

The NCP also requires methods for determining priorities for remedial actions. Therefore, under its "Hazard Ranking System," EPA annually publishes a National Priorities List of at least 400 sites where hazardous substances are known to have been released or where there is a substantial threat of such a release. (As stated earlier, EPA has now listed over 700 sites.) EPA takes five "pathways" of exposure into consideration: (1) the population put at risk; (2) the hazard potential of substances at the sites; (3) the potential for contamination of drinking water; (4) the possibility of direct human contact; and (5) the potential for destruction of sensitive ecosystems.

CERCLA gives broad discretion to EPA in determining the appropriate remedial action to be taken in a specific instance. Criteria for action are flexible within the bounds of cost-effective, environmentally sound remedies that are feasible and reliable from an engineering standpoint. A "no-action' alternative is also provided for cases in which attempting to clean up a site would present more danger to human health and the environment than leaving it alone.

Enforcement, Implementation, and Liability

Under CERCLA, EPA can take injunctive action for sites where there is imminent and substantial danger. Heavy penalties are allowed for failure to comply with an administrative order of the agency. Cleanup sites usually involve more than one company, and often, many firms whose wastes have been disposed of. These companies are held liable for cleanup. Use of monies from Superfund is prohibited if these parties are available to carry out remedial action. Consideration is being given, however, to "mixing" Superfund monies in such cases to cover the costs attributable to parties that are insolvent, unidentified, or recalcitrant. EPA will generally ask these firms to assume collective responsibility and organize themselves for cleanup efforts and their financing. Most of the action being taken at Superfund sites—as much as 70 percent—is being paid for by private companies rather than the government.

CERCLA imposes liability on responsible parties for costs of removal or remedial action, costs of response by other parties or entities, and for damage to, or destruction of, natural resources. Responsible parties can include: owners and operators of vessels or facilities, and former owners and operators of a facility at the time of disposal of wastes; persons who arranged for treatment of the hazardous substances; and persons who accepted substances for transport to a site from which a release occurred. The law imposes no liability for federally permitted releases.

Currently, the liability standard of the law is "joint and several." That is, a single party may be held responsible for all cleanup costs even if other parties are involved. Cases in which this liability may occur are those in which other parties have disappeared or become insolvent, defunct, or bankrupt. Liability attaches to a party, moreover, without regard to fault or negligence. Liability costs are high: for a facility other than a vessel or vehicle, it includes the total of all response costs plus up to $50 million for damages.

As it presently stands, CERCLA imposes no liability for *personal injury* resulting from the release of a hazardous substance. An attempt was made in the 98th Congress, however, to provide for victim compensation (see below).

Superfund Taxes

CERCLA establishes two taxes to be paid into the Hazardous Substance Response Fund:[30]

1) A tax of 0.79 cents a barrel on crude oil received at U.S. refineries, and on petroleum products brought into the U.S. It also applies to crude oil used in, or exported from, the U.S.
2) A tax on 42 listed chemicals sold by manufacturers, producers, or importers of those chemicals. The materials range from acetylene to zinc sulphate, and the taxes range from $0.22/ton to $4.87/ton. The maximum amount that can be raised from this tax is $1.38 billion.

Collection of these funds began on April 1, 1981, and will end on September 30, 1985, unless CERCLA is reauthorized by Congress. Three companies, Arco Chemical, Shell, and Exxon, which are the largest producers of ethylene and propylene, pay 25 percent of the Superfund tax.[31] A total of 12 companies (out of a total of over 700 firms paying into Superfund) pays the bulk of the tax.

A third tax is paid into the Post-Closure Liability Trust Fund. It is levied at the rate of $2.13 a dry-weight net ton of hazardous waste on receipt of the waste at a qualified disposal facility. Collection began September 30, 1983. The Fund assumes liability, under specific circumstances, for disposal facilities that have been closed and appropriately monitored for releases.

Proposals to Expand Superfund

Near the end of the 98th Congress (August-September 1984), both the House and Senate considered separate bills extending CERCLA for another 5 years, through 1990. Work is expected to resume in Congress on amending the Act in 1985. The following sections analyze major features of the proposals.[32]

Expansion of Superfund

Superfund expansion bills in both the House and Senate provided for higher taxes to greatly increase the amount of money available for cleanup of dangerous disposal sites. The House amendments would have raised the Superfund to $10.2 billion through 1990, a six-fold increase over the current $1.6 billion. The Senate bill would have potentially raised the fund to $7.5 billion.

Agreement exists on the need to increase CERCLA funding, though the size of the increase is a subject of debate. Former EPA Administrator William Ruckelshaus has commented, "it is obvious that still more funds are required, and the Superfund Act itself needs to be extended before it expires in September 1985 so we can maintain the crucial momentum of the program." EPA has reported that the government will have to spend at least $8.4 billion and as much as $16 billion to clean up the most hazardous waste sites in the U.S. The Commerce Subcommittee of the House Energy and Commerce Committee has estimated a $20 billion price tag.[33] These estimates are for total costs to be paid by government and the private sector; thus estimates for Superfund needs are considerably less.

Many industry spokesmen also agree on the need for greater funding. The Chairman of the Chemical Manufacturers Association, an organization with a strong interest in hazardous waste regulation, has stated that more funding will be needed to continue an effective program. The Association would like to see the Superfund tax mechanism changed, however.[34] (See below.)

There is general agreement that more funding is needed for cleanup of toxic waste dumps. If the EPA were to attempt to spend the sums proposed in the House and Senate bills, however, "the program would be a mess."

In spite of agreement on the need for more funding, money alone cannot solve all the problems of "orphan" toxic waste dumps. Though extra funding is needed to take action at more disposal sites than were predicted in 1980, and to do so more quickly than in the past, EPA has stated that it can effectively use only $5 billion in additional money over the next five years. The Congressional Office of Technology Assessment has reported that $6 billion in Superfund money can be properly spent. Ironically, in estimating the costs of requirements contained in the House amendments to CERCLA, EPA found that a total of $14 billion would be called for, rather than $10.2 billion. An EPA official has stated that if the agency tried to spend these larger amounts of money, "the program would be a mess."[35]

The difficulties involved in actually spending the Superfund money appear to stem from the extraordinary complexity of the cleanup task itself, as well as inherent limitations of a federal agency such as EPA. Consider the following points:

1) Contaminated groundwater is found at about half of the Priority List sites. As discussed under RCRA, tackling this problem is very difficult, if not impossible in some cases. Monitoring and cleansing of polluted groundwater must be carried out for 20 or 30 years.[36]
2) Each hazardous site requiring cleanup is different and requires different remedial approaches. Determination of proper action through engineering studies takes time as well as money.
3) If hazardous substances, contaminated soil, etc., need to be removed from a site, questions arise as to where to put them. As stated earlier, there are not enough safe, reliable disposal sites. Congress has not addressed this problem or provided incentives to rectify it.
4) EPA has begun work at about 300 of the Priority List sites. Engineering studies have been made at more than half of these, and cleanup is underway at 120 sites. EPA estimates it can work on 130 priority sites annually and also manage 200 emergency responses each year. The House bill would mandate that EPA must work on at least 150 sites a year and complete remedial action on Priority List sites within five years.[37] Increasing

> EPA funding and manpower will not solve the technological and logistical obstacles inherent in the waste disposal problem. In 1985, Superfund staffing at EPA will number 1,357 positions, twice the 1983 level.[38]

The House bill would change the amount of the tax paid by industry to 77 percent of the total. Oil and chemical companies would pay additional taxes of up to $7.8 billion through 1990.

Waste-End and Other Tax Proposals

The amendments to CERCLA proposed by the House would have provided for the development of an alternative means of Superfund taxation. The current method of taxing the feedstocks of oil and chemical firms and using some general revenues would have been supplemented with a "waste-end" tax whereby companies that actually dispose of wastes would have to pay. Since the list of industries represented as responsible parties at Superfund sites includes many businesses that are not subject to feedstock taxes, it seems reasonable to include their participation in the tax. The House proposal would have directed the Treasury Department to draft legislation designed to raise $1.2 billion in revenue from such a tax.

Arguments for and against a waste-end tax have been put forth. The chemical industry has voiced concern over the economic impact on firms that a greatly expanded Superfund would have if it were to rely heavily or exclusively on the existing tax on those firms' feedstocks. The economic impact on presently taxed firms could be substantial. On the other hand, although a waste-end tax was considered in the original 1980 Superfund bill (S. 1480, 96th Congress), it was rejected as unworkable. EPA and the Treasury maintained that such a tax would require 260,000 points of collection, with associated paperwork and administrative burdens for both industry and government.[39]

The feedstock tax was adopted in 1980 because: a) its impact, passed on through a chain of commerce, would be widespread and would raise more money with little disruptive effect; b) it would be easy to administer, applying to specific substances produced by fewer than 1,000 firms; and c) users of the taxed substances would bear the costs of the risks involved. In 1984, Congress reported that "the $7.5 billion level contained in S. 2892. . . should not be drawn exclusively from the current crude oil and feedstock taxing mechanism," although the final Senate bill did not contain a waste-end tax plan.[40]

One advantage of a waste-end tax is that its directness can change behavior. By placing the financial burden on those who actually dispose of hazardous wastes, an incentive is introduced to deal with waste differently. In particular, if ending land-based disposal is a key goal (as it is in the amendments to RCRA), then sufficient tax on that disposal method induces generators and disposers to find other safe means. The tax could also be scaled appropriately so as not to induce illegal dumping of wastes by small generators.

The element of fairness in a waste-end tax is also significant, especially if more money must be raised through Superfund taxes. The chemical and oil industries point out that more of the burden should be placed on actual polluters, such as the electronics, auto, and aircraft industries and steelmakers.

It has been estimated that companies outside the chemical industry have contributed roughly half of the hazardous materials at existing disposal sites. For example, not one manufacturer of the taxed feedstocks was among the top 25 companies that disposed of hazardous wastes at the leaking Stringfellow Acid Pits in California. Twelve of the most heavily taxed companies, including Arco, Exxon, and DuPont, point out that they pay 61 percent of the Superfund tax but produce less than half the hazardous wastes. More important, if used in conjunction with the current tax method, the waste-end tax would help to raise the additional Superfund money needed for cleanup.[41]

One compelling reason in favor of including a waste-end tax in Superfund is the fact that it would help place the burden where the problem truly lies.

On the whole, one compelling reason in favor of including a waste-end tax is the fact that it helps to place the burden where the problem truly lies. By doing so, this form of tax is an incentive either to produce less waste, or to dispose of it in ways that will not present a danger to human health or the environment.

Still, there are drawbacks to the waste-end tax. Collection of the tax could be difficult to administer, requiring assessments of 10,000 to 128,000 companies, depending on what exemptions were allowed. States that have tried the method have had revenue shortfalls, some by as much as 93 percent. This has occurred because states have incorrectly estimated the amounts of waste disposed off-site or the amount recycled or reused.[42]

Concern has also been voiced that if a waste-end tax were too successful in limiting the amount of hazardous waste to be disposed, it would not be able to generate enough funds to clean up existing problem sites. That is, with far less waste to tax, Superfund would receive less revenue. This is one reason why many affected industries want the waste-end tax to be one element in a "reasoned mix" of methods for collecting Superfund money.

Other alternative taxing methods that have been considered by Congress include the following: 1) an increase in the crude oil tax; 2) expansion of the feedstock list to include substances not now taxed but which are found at Superfund sites; 3) changes in feedstock tax rates based on the frequency with which the substances are found at Superfund sites; 4) shifting the tax on certain feedstocks to primary and secondary derivatives of those substances; 5) taxing the transportation of hazardous substances; and 6) expanding the tax base to include broad industrial segments that consume, transport, manufacture, or dispose of hazardous substances.[43]

Congress has also given consideration to tax options that would help correct anti-competitive impacts—particularly adverse effects on the U.S. chemical industry due to the import of chemicals that are not taxed. A Congressional Research Service report to Congress in 1984, however, found that Superfund taxes had only a minor impact on the industry or were not a major factor in the economic problems of the U.S. petrochemical industry.[44]

In general, it seems clear that if Congress wishes to increase revenues for Superfund, it will have to make a change in tax methods. Though there are some drawbacks in doing so, it appears advisable to incorporate a waste-end tax in the program. One estimate predicts that supplementing the feedstock tax with a waste-disposal tax, at a rate of $50 per dry-weight ton of hazardous waste, would generate roughly $307 million annually.[45]

Victim Compensation Proposals

Proposals in some of the congressional bills to compensate victims of hazardous waste pollution present perhaps the greatest potential problems of any single issue connected with Superfund.

The Senate amendments to CERCLA (S. 2892) contained a proposal to provide $20 million in grants to states for "a program of assistance to individuals suffering injury resulting from exposure to the release of hazardous substances, pollutants, or contaminants." The assistance included death benefits, medical insurance, and group disability insurance. Other compensation proposals have been considered for several years. Some have also been connected with exposure to Agent Orange and with occupational exposure to toxic substances such as asbestos.

Four major compensation bills have been introduced in Congress by Sen. Robert Stafford of Vermont, Rep. John LaFalce of New York, Sen. George Mitchell of Maine, and jointly by Reps. Edward Markey of Massachusetts and James Florio of New Jersey. All four would create "strict liability" and would establish "joint and several" responsibility.

Compensation cases involving exposure at hazardous waste sites present unique difficulties. The number of people affected by contamination generally cannot be determined adequately, and the causal relationship between exposure and resulting illness usually is very difficult to determine. In addition, illnesses can remain latent for many years after actual exposure to many hazardous substances. Furthermore, compensation claims filed by individuals or groups are generally for enormous sums of money.[46]

Several aspects of victim compensation that have been considered by Congress have widespread ramifications. One is the notion of "absolute liability," which means that even though a firm may put non-hazardous material in a waste facility, it could still be held responsible for any adverse effects resulting from contamination caused by the site. Unlimited retroactivity was attached to this concept when it was included in the original version of H.R. 5640.

Another controversial concept that has been considered in victim compensation measures is that of "rebuttable presumption." At present, plaintiffs must provide scientific evidence to prove conclusively that their illnesses resulted from exposure to a specific hazardous or toxic chemical. Rebuttable presumption obviates the need to link the illness with a source by presuming that a preponderance of known facts establishes the link. The evidence is, therefore, considered indirect and "presumed." The burden of proof is then imposed on the defendant, who must show that his actions did not directly contribute to the plaintiff's illness.

Rebuttable presumption is a faulty concept. It basically relies on a legal notion of guilty until proven innocent that is contrary to the American concept of justice. Given limited medical knowledge of the causes of some illnesses (particularly forms of cancer), proving innocence is a difficult task. Rebuttable presumption could also induce an onslaught of compensation suits by anyone who has had exposure to hazardous waste, whether or not ill effects have resulted. In addition, the concept could cause a wide range of companies to declare bankruptcy in the face of large numbers of expensive claims, as was the case with Manville Corporation when it was faced with a flood of asbestos-exposure law suits.[47]

"Rebuttable presumption"—presuming that a plaintiff has been harmed by exposure to a hazardous substance unless proven otherwise—could induce an onslaught of compensation suits if included in the new CERCLA legislation.

A September 1982 study mandated by CERCLA on the victim compensation issue contained a recommendation for the rebuttable presumption concept rather than the need to show any cause-and-effect relationship. The report also recommended a no-fault compensation system, dubbed "Son of Superfund," that would likewise be financed by taxes on feedstocks and a small portion from general revenues. The no-fault system would impose standards of strict liability (i.e., liability without regard to negligence) on firms which handle hazardous wastes. Claimants would be allowed up to three years to file a claim after discovery of injury. The study rejected EPA's estimate that potentially 1.2 million people are exposed to health dangers from hazardous wastes and stated there is not enough information to make an estimate.[48]

General agreement exists that common law in most States makes it very difficult for damages to be recovered in cases of legitimate injury. Affected industries, however, are firmly opposed to the rebuttable presumption concept because of the enormous potential financial liability it would pose, and its potential for large-scale abuse. Industry is also concerned about the use of "joint and several" liability in compensation cases, since one defendant could be made to pay for all damages even in instances where several defendants may be identified. At least in theory, injured parties might be tempted to pursue judgment against the most profitable companies rather than those firms which may be most at fault.

Insurers are concerned about the mixture of no-fault and fault-based solutions, the proposed changes in legal procedure, and the scientific limitations in proving causal linkage. A test case involving insurance firms has already occurred in Minnesota, where one section of the state's Superfund law provides for a strict liability standard if an injury can be traced to the delayed effects of toxic material. Under this "causation" section, a defendant (such as a company handling hazardous waste) in a toxic test case must prove that it did not cause a worker's injury. A second provision makes some companies that generate toxic waste liable for problems as far back as 1960, and the liability is "joint and several." As a result, the insurance industry has stopped writing personal liability coverage in Minnesota for any damages stemming from "non-sudden" pollution. ("Sudden" pollution would include hazardous substances released from a tank car in a train accident, for instance.)[49]

An additional significant factor in the victim compensation issue is the problem of reliable data on the health effects of various hazardous wastes. The six major categories of hazardous substances—radioactives, flammables, heavy metals, asbestos, synthetic organic chemicals, and acids and bases— behave differently, have different environmental "fates," and can have effects in the environment and on human health that are unique to themselves. Moreover, the concentration at which one substance may be dangerous may differ markedly from dangerous concentrations of other substances. Industry has expressed the need for further and better research on health effects—not only to discover the health effects themselves but also to determine the magnitude of the problem in the environment.[50]

All in all, victim compensation proposals pose special problems and have the potential of becoming an enormous nightmare for a wide variety of affected industries. The insurance costs alone could be staggering. The general counsel of the Office of Management and Budget, Michael J. Horowitz, has remarked, "I know of no greater fiscal threat for the Nineties than the whole question of toxic torts and victims' compensation."[51]

Mandatory Cleanup Standards

Both the House and Senate proposals for amending CERCLA contained provisions for mandatory levels of cleanup at Superfund sites. Language on cost-effectiveness was included in each. Section 108 of H.R. 5640 states that EPA should select "to the maximum extent practicable. . . permanent solutions and alternative treatment technologies or resource recovery technologies that in whole or in part, will result in a permanent and significant decrease in the toxicity, mobility or volume" of hazardous substances. The bill requires cleanup to the level of the most stringent standards specified under other major environmental laws. It allows for consideration of "long-term maintenance costs."

Section 17 of S. 2892 directs EPA to select, "to the extent practicable," remedial actions that "completely remove" released hazardous substances from the environment. It allows consideration of both short- and long-term costs.

Mandatory cleanup standards have two major drawbacks: cost and inflexibility. EPA itself has maintained that uniform standards cannot be strictly applied to hazardous waste sites. Several examples illustrate the problem.[52]

One Superfund site is a part of the Hudson River bed where firms had disposed of polychlorinated biphenyls (PCBs). EPA has reported that dredging the river to meet the standards of the Toxic Substances Control Act—as would be required under new amendments—would stir up the pollutants and create more of a hazard than would be the case without mandatory standards. Since the river bed has a cover of silt, scientists advised EPA to take action on the river banks and let the bottom clean itself over the next 70 years.

Another case is Waukegan Harbor near Chicago in Lake Michigan. A cleanup to meet the uniform regulatory standards would cost $80-100 million. Meeting less stringent standards that would not affect the health risk assessment would cost $20 million. (Average cost of a site cleanup, however, is $6.5 million.)

A third case in point is the 20-acre French Limited Lagoon near Houston, where several companies that disposed of waste are paying for cleanup of the site rather than Superfund. Arco Chemical, one of the contributors, has estimated that it will spend $5 million to help detoxify the lagoon under present law, but that it would need to spend $25 million if H.R. 5640 were passed.

The need for flexibility in cleanup efforts is essential, since the problems at hazardous sites call for very different tactics and solutions. Mandatory standards could waste large sums of money, compared to cost-effective alternatives.

Citizen Suit Provisions

Section 116 of Title II of H.R. 5640 included a provision for citizen suits whereby any person can bring civil action against anyone "who is alleged to be in violation of any requirement" of CERCLA, including the United States government and the EPA Administrator. Congressional opponents of this view have pointed out that EPA could be sued whenever it fails to meet a "nondiscretionary" duty, which would include adherence to mandatory cleanup schedules. The proposed bill called for EPA to conduct at least 150 on-site remedial actions annually (beginning in fiscal 1987), as well as specified remedial investigations and feasibility studies (RI/FS). EPA has stated it would have difficulty meeting these deadlines. Lawsuits could number in the hundreds under these provisions alone. The agency could spend more time in court defending itself from citizen suits than it spends in actual cleanup efforts.[53]

Summary

Public concern about hazardous waste cleanup virtually assures that Congress will reauthorize CERCLA in 1985. The difficult aspect is assuring that Congress will enact changes that are reasonable, manageable, and in keeping with both the complexity of the problem, and the resources available to deal with it.

PART THREE: RECOMMENDATIONS

This section presents courses of action that would promote the safe management of hazardous waste in an efficient and effective manner. Although the Resource Conservation and Recovery Act has recently been amended, the suggestions here provide direction to EPA in carrying out the Act's provisions. Since the Comprehensive Environmental Response, Compensation, and Liability Act will be on the legislative agenda for the 99th Congress, it is hoped that these recommendations will promote changes in the Act that will make it more reasonable and manageable for both government and industry.

Solutions to the Waste Problem: General Principles

The potential benefits of RCRA and Superfund are apparent to the public—a cleaner and safer environment. The costs are not so obvious, but they can be substantial. In the end, of course, it is not the firms themselves that bear the costs of hazardous waste disposal and cleanup but rather the consumer, since these costs are reflected—but not separately identified—in the prices of products. Two primary principles should be applied to waste disposal solutions under RCRA.

1) Economic incentives, such as pollution taxes, should be used more widely to promote private decision-making responses that promote new (or better) disposal or recovery technologies. This approach will also generate public funds to promote establishment of new, safe disposal sites.

2) The burdensome nature of compliance with disposal regulations should be reduced by minimizing the staggering amount of paperwork currently required.

The administrators of CERCLA should remain concerned with the safe cleanup of existing wastes. Simultaneously, they should also focus on the following three principles governing hazardous waste cleanup.

1) Protect and promote safe, adequate disposal sites and disposal techniques.

2) Foster voluntary cleanup efforts by industry.

3) Promote ways of making existing disposal sites safe for surrounding residents. Compensation for victims should be left to the courts.

Consistent with these broad principles, the following specific recommendations are offered.

Resource Conservation and Recovery Act

1) *Help small quantity generators comply.* EPA must be allowed to use simplified, innovative ways to assist small quantity generators and encourage their compliance with regulations. High costs, especially the "cradle-to-grave" paperwork burden, could prove counterproductive if they deter compliance by these firms.

2) *Supplement land disposal restrictions.* In phasing out land disposal of hazardous wastes, Congress should provide economic incentives to: a) assure an adequate supply of safe land-based facilities, b) encourage alternative technologies for waste disposal, and c) reduce the amounts and types of waste generated.

3) *Replace the requirement to retro-fit existing facilities.* Substitute a three-pronged effort for the recently enacted program of retro-fitting land disposal sites: a) promote the creation of highly secure disposal facilities to which the waste from problem sites could be moved, b) provide direct encouragement of alternative technologies for handling hazardous waste, and c) completely secure those sites that are already contaminated and use them as central depots for wastes.

4) *Minimize wastes.* Congress should offer a "carrot and stick" incentive system to minimize the amounts and toxicity of hazardous wastes. A useful approach would include investment tax credits for equipment involved in processes that reduce hazardous wastes and progressive taxes assessed on the amount of waste production.

5) *Improve regulation of underground storage tanks.* A program of voluntary compliance with recommended standards for the hundreds of thousands of underground storage tanks in the private sector would be more cost-effective than mandatory regulation. As it stands, it is likely that EPA—even if its budget and staffing are greatly increased—will be unable to meet the requirements of this provision.

6) *Repeal the "hammer" provisions.* The hammer provisions—whereby if EPA fails to meet deadlines set in RCRA, the resulting costs are imposed on industry—should be repealed. A better course is to promote use by EPA of private-sector resources for studying hazardous wastes and developing standards for their disposal. This approach is aimed at achieving a goal rather than imposing a deadline.

Comprehensive Environmental Response, Compensation, and Liability Act

1) *Modestly expand Superfund.* The expansion proposed for Superfund should be reduced to more realistic levels. EPA has repeatedly stated that it cannot spend the additional money proposed for cleanup efficiently or effectively. Throwing more money at the hazardous waste problem, without achieving proportionate results, will only discredit the entire effort.

Revising the funding levels of CERCLA will not be enough. Congress needs to address the following problems as well; a) the complexity of hazardous waste cleanup, particularly with regard to groundwater; b) the flexibility required in cleaning up individual sites; c) the shortage of safe, reliable sites to which waste material from "orphan" sites can be sent; and d) the limitations of EPA's resources and scientific knowledge.

2) *Adopt a waste-end tax component.* Adding a waste-end tax element would spread the burden of Superfund more equitably across industries, particularly industries that produce and dispose of wastes. Ideally, it would act as an added economic incentive to reduce production of hazardous wastes.

3) *Use workmen's compensation approach.* Proposals to compensate victims of hazardous waste should be replaced by a limited, short-term program of no-fault compensation for injury along the lines of workmen's compensation. Funding for such a program should come from an extremely broad base of U.S. industries. Scientific and medical research into the linkage between hazardous substances and human health should be pursued. Clear-cut data on this highly complex issue are lacking.

4) *Write flexible cleanup standards.* Standards for cleanup imposed under CERCLA should reflect the need for flexibility in cleanup actions geared to specific sites. The basic and overriding feature should be the ability to tailor a wide variety of approaches to individual problems.

5) *Avoid citizen suits.* Eliminate provisions that allow lawsuits against the government for failing to meet unrealistic deadlines and schedules. Such litigation will hamstring cleanup efforts and deflect resources from the main purpose of CERCLA itself.

Conclusion

John Quarles, former assistant administrator of EPA, has documented the problems experienced by EPA in initiating hazardous waste programs in the latter half of the 1970s. He states that many of the circumstances we face today in promoting safe disposal of wastes are the result of a failure to set priorities under RCRA. Early regulations "reflected a simplistic philosophy of requiring every operator [of a waste facility] to meet a Cadillac standard. . .to ensure there would be zero leakage of contaminants into groundwater" and to retro-fit all existing facilities. EPA finally saw the necessity of tailoring remedial actions to the circumstances of each problem site. Quarles' conclusion is revealing:

> Driven by the forces of environmental politics, we have repeatedly committed ourselves to goals and programs that are utterly unrealistic. By doing so we have deployed regulatory manpower unwisely, diverting limited resources to concerns of marginal importance.[54]

In addition, government has too often responded in a "rubber band" fashion—reacting in haste to public outcry by instituting sweeping programs aimed at real or perceived problems.

The need for regulation of hazardous wastes is universally accepted in the United States. Areas of disagreement, however important, are limited to specific regulatory approaches to the hazardous waste problem. The public's great concern about this issue is not matched by an equal degree of information concerning the complexity and the ramifications of methods proposed for solving the waste management problem. The scarcity of safe, reliable disposal sites is a major issue not addressed in the current regulatory approach.

This analysis of major changes proposed or enacted in the laws governing hazardous waste disposal and cleanup points out other regulatory shortcomings. For RCRA, Congress has tightened restrictions on disposal, greatly expanded EPA control over hazardous wastes, and imposed deadlines on EPA formulation of regulations. For CERCLA, proposals in Congress would greatly increase Superfund taxes and expand the program into the area of victim compensation.

Though well-intentioned, Congressional actions continue to be characterized by a command-and-control approach. In many cases, inflexible regulations and unrealistic deadlines will merely hamper EPA's and industry's ability to address the real issues.

Though well-intentioned, Congressional actions continue to be characterized by a command-and-control approach. Such actions fail to recognize adequately the overwhelming complexity of the problem. In many cases, inflexible regulations and unrealistic deadlines will merely hamper EPA's and industry's ability to address the real issues.

The legislators' posture towards the regulated industries needs to be reevaluated. Obviously, some industries bear responsibility in this area, but should they be treated as criminal adversaries? By and large, the hazardous waste management practices carried out in the past were not only legal at the time, but many were also recommended by government.

Even though industry possesses the technology, managerial skills and the money to effectively tackle the problem, the current regulatory environment discourages such action. Given the constant threat of civil and criminal sanctions, with attendant massive financial liabilities, industry lawyers are likely to advise inaction as the safest strategy, at least from a legal standpoint.

Granted, Congress and EPA *should* exert firm and consistent enforcement pressures on prospective illegal waste management and those companies that have little regard for reasonable regulations. However, if sites are to be cleaned up and if waste management practices are to be reformed effectively, a more constructive approach will be necessary.

Ultimately, the challenge for both government and the private sector alike is to better inform the public as to the true nature of the waste management problem. The public ranks hazardous waste sites lower than prisons, mental hospitals, and airports as an acceptable neighbor. The battle cry is now common: "not in my back yard." Highly publicized instances of mismanagement of wastes have given people cause for alarm. Accidents and illegal dumping have provoked an abiding fear of chemicals that will be hard to put to rest.

And yet, no modern economy can exist without producing many undesirable waste products. These materials are inevitable by-products of goods desired by consumers. Even ardent proponents of rigid federal regulation of hazardous waste recognize that "we have become a society highly dependent on toxic chemicals. We cannot . . . power automobiles, paint houses, grow food, make and dye clothes, or print books without generating substantial amounts of toxic wastes." [55]

Thus, the shortcomings in current federal environmental policies for hazardous wastes are matched by equally important shortcomings in public awareness. The United States can deal with hazardous wastes safely, effectively, and efficiently only if society is properly informed of the trade-offs it faces.

Notes

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2. U.S. General Accounting Office, *Hazardous Waste Sites Pose Investigation, Evaluation, Scientific, and Legal Problems,* CED-81-57, April 24, 1981, p. 1.
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4. For details on definitions, classifications, and excluded substances, see Quarles, Chapter 4.
5. Derived from Quarles, Chapter 2, pp. 15-20.
6. See Quarles, Chapter 2, pp. 20-28. A technical overview is contained in *Technology for Managing Hazardous Wastes,* a report prepared for the New York State Environmental Facilities Corp. by the Rensselaer Polytechnic Institute, September 1979. See also Council on Environmental Quality, *Environmental Quality 1981* (Washington, D.C.: U.S. Government Printing Office, 1982), pp. 101-111; and Samuel S. Epstein, Lester O. Brown, and Carl Pope, *Hazardous Waste in America* (San Francisco: Sierra Club Books, 1982), Chapter 12.
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9. Westat, Inc., *National Survey of Hazardous Waste Generators and Treatment, Storage and Disposal Facilities Regulated Under RCRA in 1981* (Rockville, MD: Westat, Inc., 1984), p. 123.
10. William D. Ruckelshaus, "We're Doing Our Best to Protect the Public," *USA Today,* October 10, 1984, p. 10A.
11. See Quarles, pp. 28-35, for a thorough and highly readable discussion of groundwater.
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19. Derived from Quarles, pp. 39-47.
20. U.S. Congress, House, Committee on Energy and Commerce, *Hazardous Waste Control and Enforcement Act of 1983,* 98th Congress, 2d sess., May 17, 1983, H. Rept. 98-198, Part 1, p. 19 ff.; and U.S. Congress, Conference Report, *Hazardous and Solid Waste Amendments of 1984,* 98th Congress, 2d sess., October 3, 1984, Rept. 98-1133, p. 80. The summary of the RCRA amendments is derived from the Conference Report. The *Hazardous and Solid Waste Amendments of 1984* bill technically amend the Solid Waste Disposal Act (42 U.S.C. 3251), which was subsequently amended by the

Resource Conservation and Recovery Act of 1976 (P.L. 94-580).

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22. Arthur D. Little, Inc., *New Hazardous Waste Treatment and Disposal Techniques for the U.S.: Applications and Business Opportunities—1983-1993* (Cambridge, MA: Arthur D. Little, Inc., 1984), pp. vi, 2-4.
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Reforming Water Pollution Regulation

by Paul N. Tramontozzi

CENTER FOR THE STUDY OF AMERICAN BUSINESS

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Introduction

Clean water is one of the most widely supported environmental goals in the United States. Yet, there is little agreement on how best to attain it. Strong divisions in Congress over legal and technical issues have delayed reauthorization of the federal government's major water pollution control law, the Clean Water Act, for over three years.[1]

This report examines the sources of water pollution and the effectiveness of federal efforts to regulate them. The purpose is to provide a sound basis for proposing ways in which the law can be improved. Political debates over regulatory reform in this area have been characterized by oversimplification. It is hoped that this report will contribute to a more rational debate.

This study reviews the major sources of surface water pollution, i.e., those affecting navigable rivers, lakes and streams. (Pollution of groundwater, wetlands and coastal areas are excluded from consideration here.) Next, the evolution of federal water pollution control legislation and its key features are examined, and the successes and failures of these laws are evaluated. Finally, the most recent legislative proposals for maintaining federal water pollution management are assessed, and recommendations for improving the laws are presented.

Water Pollution Sources

Water pollution occurs when the quantity of wastes flowing into a stream overwhelms its capacity to assimilate pollutants; the natural cleansing ability of oxygen is compromised, and the water can no longer break down organic pollutants, making it unsuitable for certain uses. The depletion of oxygen can be caused by excessive loads of sediment from soil erosion, or by toxic pollutants from settled air pollution or industrial waste.

Excessive nutrients from agricultural activities (water-borne animal wastes and fertilizers) and municipal sewage can cause eutrophication, a choking ecological imbalance that favors algae growth at the expense of other forms of aquatic life. Large algae formations at the surface deplete available oxygen and prevent sunlight from reaching submerged vegetation. Photosynthesis—the process by which plants produce food and oxygen— is seriously hampered, reducing both support for aquatic life and the assimilative capacity of the stream.

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Materials that produce water pollution may enter streams directly or indirectly. Pollutants from a point source such as a factory or a sewage plant are disposed directly into streams. Point source discharges occur in a fairly predictable manner. Ordinarily, these sources generate waste as part of an ongoing production or treatment process. Thus, the level and composition of pollution is relatively consistent. Wastewater from these sources enters a stream at a specific point, making it possible to monitor the quality of effluent discharged. Point sources are relatively easy to regulate. Since their polluting "systems" are both stationary and conspicuous, it is possible to locate polluters and control their behavior by issuing them permits, making enforcement possible.

In contrast, pollution from nonpoint or area sources enter indirectly, in a much less predictable manner. Rainstorms and melting snow produce runnoff, which carries pollutant-laden sediment and debris from forests and farms, construction sites, and city sewers and streets. Agricultural runoff often contains excessive concentrations of fertilizers and pesticides. Urban runoff carries settled automobile-related pollutants, animal wastes, litter, salt and other de-icing solutions.

Nonpoint sources are not closed systems that discharge an expected amount of pollution. Discharges are intermittent and entirely dependent on a varying set of geographic and weather related conditions. Degradation of water from nonpoint sources is caused by the cumulative effect of all the pollutants that originate from large land areas within a given watershed. It is very difficult to trace a specific quantity of pollution to a single source, or even a local one. A water quality problem experienced downstream can originate from farms or cities hundreds of miles upstream.

While an effective control policy may reduce nonpoint source pollution, it is not a problem that is going to be eliminated. Adverse weather conditions can render even the best possible control program ineffective. For instance, during an extended dry period, the accumulation of pollutants on land surfaces can be substantial. When runoff occurs, pollutants will enter streams in very high concentrations; these "shock loads" normally overwhelm even streams with a high assimilative capacity. Thus, the level of nonpoint pollution appears to be the controlling factor in water quality degradation.

The extent to which nonpoint shock loads compromise water quality also depends on "natural" conditions such as stream characteristics—water temperature, chemical composition, and the rate of flow, all of which vary seasonally. Yet, even a healthy stream at peak assimilative capacity cannot break down all types of pollutants. Some materials are not degradable. Scientific research and the development of new products have produced a whole range of new and complex pollutants that water cannot assimilate.

National figures on the relative contribution of nonpoint sources to water quality degradation have not been fully developed. Preliminary data from Resources for the Future (RFF) indicate that in many areas, a majority of toxics come from urban runoff, even in cities like Houston, where there are a significant number of industrial point sources.[2]

Table 1

DISCHARGE OF CONVENTIONAL POLLUTANTS TO WATERWAYS BY SOURCE

(Percent of Total Discharge)

	Biochemical Oxygen Demand	Total Suspended Solids	Total Dissolved Solids	Total Phosphorous	Total Nitrogen
Point Sources					
Municipal	18.0	0.1	1.7	2.9	7.9
Industrial	25.0	1.5	15.6	10.3	3.9
Subtotal	43.0	1.6	17.3	13.2	11.8
Nonpoint Sources					
Cropland	21.0	30.4	25.6	27.3	37.0
Urban	2.0	0.3	0.4	0.1	--
Other*	34.0	67.7	56.7	59.4	51.2
Subtotal	57.0	98.4	82.7	86.8	88.2
TOTAL	100.0	100.0	100.0	100.0	100.0

*Includes construction, mining, erosion, irrigation return flow, oil spills, unsewered household discharge, forestry, and livestock activities.

Source: Resources for the Future.

Findings on certain conventional pollutants are more conclusive. As Table 1 shows, nonpoint sources discharge over half of Biochemical Oxygen Demand (BOD, a measure of oxygen-demanding substances that can be broken down by water), nearly all suspended solids (sediment), and most of the dissolved solids, phosphorous and nitrogen.

Several nationwide surveys affirm the importance of nonpoint source pollution. In the most recent biennial state water quality reports (required under Section 305(b) of the Clean Water Act), virtually all of the states and territories acknowledged that they have serious nonpoint source pollution problems.

At least half of these characterized the problem as "major." Eighteen states considered agriculture the most serious nonpoint source, while urban runoff was cited as the second most serious contributor. In addition, 40 of the 45 states that participated in the States' Evaluation of Progress project conducted by the Association of State and Interstate Water Pollution Control Administrators believe that effective control of nonpoint sources is required for any significant improvements in water quality.[3]

The Evolving Federal Role

Early Laws

Federal involvement in water pollution control dates back to the 1899 Refuse Act which required a permit for dumping into navigable waters. This program was administered by the Army Corps of Engineers and its main purpose was to prevent the obstruction of navigation along interstate and coastal waters.

With the passage of the Federal Water Pollution Control Act in 1948, the U.S. government recognized water pollution as a potential ecological and public health hazard. The law left primary responsibility for control and enforcement to the states; the federal role was limited to technical support and some financial aid for the construction of sewage treatment plants.

The Act directed the Surgeon General to encourage pollution abatement through research and investigation. The legislation also called for regulation under a water quality standards approach. First, state and local authorities designated the primary beneficial use of a particular waterway— fishing, boating, drinking or irrigating, for example. Then they set discharge standards that they believed would protect that use.

Even though it identified public health as a factor of "paramount importance," the law permitted courts to require pollution reduction only after "giving due consideration to the practicability and to the physical and economic feasibility of securing abatement of any pollution proved."[4]

The Act did authorize a fund of $22.5 million annually from which low-interest (2 percent) loans could be made to local publicly owned treatment works (POTWs). In order to be eligible for a loan, a local POTW had to have its plan approved by both the Surgeon General and the Federal Security Administrator. Loans were also limited to one-third of capital expenditures or $250,000, whichever was smaller.

However, funds were never actually appropriated for loans until the Act was amended in 1956.[5] By that time, the low-interest loans had become grants, and the amount authorized for this purpose had been doubled. The federal share of a particular project was determined by a formula based on the state's per capita income. In addition, the law stipulated that 50 percent of all grants were to go to communities with populations of less than 125,000.

Though Congress was careful to reaffirm the primary responsibility and jurisdiction of the states in 1956, the federal role was expanded nonetheless. With the establishment of a federal enforcement mechanism—a conference procedure with hearing boards and court injunctions—the states' authority was superseded by the federal government. At first, federal jurisdiction applied only to interstate waters but the 1961 amendments extended it to all navigable waters and coastal waters.[6]

With passage of the Water Quality Act of 1965, the federal government became directly involved in the states' standard-setting process. The law required states to establish ambient water quality standards based primarily on the classified use of a stream. These standards were subject to federal approval. States without approved plans had to adopt federally established standards.

As a national environmental consciousness developed in the late 1960s, water pollution laws came under greater criticism. Highly publicized examples of grossly polluted rivers and lakes —with photos of fish-kills and reports of rivers catching fire—became increasingly common.

By 1970, a developing consensus in government held that the major shortcoming in the legislation was the lack of enforcement provisions. Essentially, government officials had to establish a clear cause-and-effect link between an individual polluter and the degradation of water quality below existing standards. Without adequate technical capability, it was difficult to establish such a precise connection, particularly when many dischargers used the same stream. The problem was even more complicated in the case of interstate streams.

Furthermore, state authorities usually lacked the necessary scientific techniques for determining how much pollution a body of water could assimilate without dropping below the intended water quality level. As a result, states found it difficult to issue permits under a water quality standards scheme, leading lawmakers to establish a federal system of permits under the Water Quality Improvement Act of 1970.

This law adopted a program comparable to the one set up under the 1899 Refuse Act; it focused primarily on sources of pollution—characteristics of a receiving stream had no role in the determination of policy. This fundamental shift to technology-based standards was induced by widely held perceptions that the water quality standards approach had failed. After congressional hearings concluded that many thousands of industrial plants were discharging wastes into navigable waters without a permit under the 1899 Refuse Act, then-President Nixon issued an executive order directing adoption of a permitting program under the 1899 Act.

A Major Initiative: The 1972 Amendments

The gradual federal encroachment on the states' water pollution responsibilities culminated in the 1972 Amendments to the Federal Water Pollution Control Act. The title of the bill is somewhat misleading, however, for it suggests that mere additions were made to an existing law. In reality, the 1972 legislation was a completely new law—a "massive new effort"[7] that sought not merely to control pollution, but to eliminate it entirely.

The 1972 Amendments set a goal of "zero-discharge" by 1985. Until such time, the interim goal, wherever attainable, was to make lakes and streams swimmable and fishable by July 1, 1983. Both goals were widely regarded as unattainable and unenforceable at the national level. Nevertheless, supporters of the law defended them by distinguishing a "goal" from a legally required "policy."

The gradual federal encroachment on states' water pollution responsibilities culminated in 1972 with legislation that sought not merely to control pollution, but to eliminate it entirely.

Goals, they argued, were only intended to serve as a focal point for developing long-range policy planning for industry and government. With a zero-discharge goal in place, it was reasoned, using water resources for waste disposal could no longer be taken for granted. Presumably, new industrial processes would have to be developed. Materials would have to be recycled, or at least treated before being discharged into the water.

Following the precedent established under the Water Quality Act of 1970, the 1972 Act focused largely on effluent standards. In other words, the law sought to regulate the quality of the wastewater discharged, with considerably less attention given to the actual effect of pollution on water quality. Technology-based standards were to be established for plants within the same industry and applied uniformly throughout the nation.

Industries were required to meet minimum standards—Best Practicable Technology (BPT)—by July 1, 1977. In general, this was defined as the average level of treatment attained by well-operated plants within a given industrial category. The law also required industrial dischargers to achieve a more stringent level of treatment—Best Available Technology (BAT)—by July 1, 1983.

Municipal dischargers or publicly owned treatment works (POTWs) were required to meet effluent limitations based on "secondary treatment" by July 1, 1977; 85 percent of the conventional pollutants in municipal wastes had to be removed by that deadline. Since some industrial plants discharge their wastewater into municipal sewers and POTWs, the law also required these "indirect" dischargers to "pretreat" any pollutants that might interfere with the effective operation of a POTW, or that might pass through the process entirely untreated.

In order to implement the technology-based standards, Section 402 of the 1972 Act established the National Pollutant Discharge Elimination System. This regulatory mechanism provided for the issuance, renewal and upgrading of permits for all point sources. These permits were the basis for a much simpler enforcement. Either a plant was in violation of its permit or it was not. The government no longer had to prove damage in order to punish a polluter.

Nevertheless, this simplified enforcement process carried with it a burdensome administrative cost. To begin with, the information required in a permit is substantial. Each permit must list not only the limitations on both the amount and concentration of substances that can be legally discharged, but also such information as compliance schedules for construction and the submission of reports; penalties for permit violations and procedures through which permits may be modified; as well as monitoring and record keeping requirements. EPA had to write approximately 75,000 permits, an onerous task that became even more so as requirements became increasingly more sophisticated.

Though the permitting process covered only point discharges, the importance of nonpoint sources was tacitly recognized in Section 208 of the 1972 law. This "Areawide Waste Treatment" provision had a significant nonpoint source component. State and local authorities were required to develop a process for identifying significant nonpoint sources and to set forth control procedures, including, where appropriate, land use regulations.

Congress intended Section 208 to serve as a "control tower" for the entire Act.[8] It was hoped that areawide planning of all water pollution activities (including Best Management Practices (BMPs), pretreatment, and POTW construction and operation) for the present and future would bring a badly needed degree of rationality to the effort, and expedite state achievement of water quality goals.

Congress also hoped to facilitate attainment through a substantial strengthening of financial assistance to municipalities. A more generous fiscal "carrot" was offered to help speed up municipal construction of sewage treatment facilities and insure compliance with the stringent effluent requirements of the law; $20.75 billion was authorized for construction grants with the federal government paying 75 percent of all project costs.

A Shift to the Control of Toxics: The 1977 Clean Water Act

Although the Clean Water Act of 1977 has been called a "midcourse correction,"[9] the law essentially "stayed the course"—by maintaining its effluent standards-based regulatory strategy, and continuing the main focus on point sources. Nevertheless, the 1977 effort responded to the practical problems encountered previously.

First, the unrealistic compliance deadline for secondary treatment of municipal wastes was extended to July 1, 1983. The 1972 effluent limitations for industry were altered and deadlines extended. More stringent controls were reserved for more damaging pollutants. Priority toxic pollutants were to be controlled through the use of Best Available Technology (BAT), while conventional pollutants were to be regulated through Best Conventional Technology (BCT), a more flexible level of control comparable to secondary treatment. BCT and BAT had to be achieved by July 1, 1984.

Construction Grant Reform: The 1981 Amendments

The Clean Water Act of 1977 also continued the construction subsidy program for sewage treatment plants with an authorization of $25.5 billion. Despite this enormous federal commitment, the program was severely criticized. In late 1980, the House Public Works and Transportation Committee released a report that lamented:

> Despite more than seven years of effort, the lion's share of the nation's municipal treatment problem has yet to be addressed. As of September 1980, fewer than 2,300 municipal wastewater treatment projects, valued at $2.8 billion, had been completed. More than half of the nation's 20,000 plus municipal dischargers, including 106 of the largest urban areas, have yet to comply with the 1977 treatment requirement.[10]

The congressional report confirmed similar conclusions reached in a General Accounting Office (GAO) study of the same year. In a sample of 242 plants in 10 states, the agency determined that 87 percent were violating effluent discharge standards. The report concluded, "Many [of the plants] are not treating wastewater at the efficiency levels they were designed to achieve."[11]

Because grants focus solely on construction, localities have had every incentive to build elaborate systems whether or not they are needed, and whether or not they can afford to operate and maintain them.

Water pollution control professionals and the EPA claim that the reality of municipal compliance has been distorted. Due to the tremendous lead time necessary to complete projects, it is difficult to see significant progress in such a massive program. Even though the U.S. population increased 3.4 percent between 1976 and 1980, the portion of that population served by treatment plants increased by 17 percent. Also, during the same period, the number of people serviced by POTWs providing secondary treatment of wastewater increased by 25 percent.[12]

Nevertheless, serious problems remain, including: overdesigned facilities plagued by excessive cost overruns, inadequate planning and lengthy delays in implementation. Reports from Congress and GAO stress different combinations of these factors in assessing the causes of the program's poor performance. GAO highlighted technical shortcomings such as design and equipment deficiencies, and the lack of qualified operating and maintenance staffs.

The congressional survey faulted unrealistic compliance schedules and excessively stringent water quality goals. It also reported significant delays caused by an overly complicated regulatory process, noting that

> where once a municipality could expect to start and finish a project within two or three years, it now takes an average of eight years from the submission of a planning grant application by a local authority to the completion of construction.[13]

A fundamental shortcoming is in the nature of the grant process itself. First, because grants focus solely on construction, states and localities have had every incentive to build the most elaborate system currently available whether or not it is needed, and whether or not they can afford to operate and maintain it. The American Society of Civil Engineers states:

> The construction grants program has resulted in high-tech, sophisticated (and over-designed) plants being built to serve a limited area that cannot or will not hire experienced operators to run them. Moshiem, Tennessee, for example, is installing a pressure sewer system with over 200 pumps and is not making provisions for maintenance. Another city passed a sewage rate ordinance promising to collect money for the operation and maintenance of the wastewater treatment plant. This money, however, is being used to extend sewer lines while the plant deteriorates.[14]

In an effort to improve the overall effectiveness of the program, the Reagan Administration pushed a major revision of the program through Congress in late 1981—perhaps the only significant regulatory reform achievement in the environmental area. The Municipal Wastewater Treatment Construction Grant Amendments of 1981 made the following key changes:

- Grants for the planning and design of treatment plants were eliminated;
- The federal share of project costs was reduced from 75 percent to 55 percent;
- The grants can only be applied to the construction of facilities that will meet current needs. Construction of reserve capacity to accommodate anticipated population growth must now be financed solely by localities; and
- Only those projects that will provide "secondary treatment" are eligible for grants. Projects designed to correct combined (sewage and storm water) sewer overflows, or to rehabilitate aging systems, or to construct collector sewers that carry sewage from homes to the main system, are no longer eligible. Finally, the definition of "secondary treatment" was revised to allow less complex systems to meet compliance standards.

The main intent of the revisions was to promote greater local responsibility. The reduction in federal share was meant as a signal to communities that federal financing will be phased out eventually. By eliminating grants for planning and design, the law provides an incentive for local authorities to develop more realistic projects within their range of financial and technical capability. Finally, by redefining what constitutes an acceptable level of "secondary treatment," about 3,900 small communities (most with populations under 10,000) will be able to forgo building costly and unnecessary plants, saving an estimated $2 billion.[15]

Evaluating the Clean Water Act

The Benefits and the Costs

Since its enactment, the Clean Water Act has been judged to have been at least moderately successful. A recent analysis from the Association of State and Interstate Water Pollution Control Administrators finds that despite significant pressures (more wastes from industry and people), degradation of water quality has been largely arrested.

However, data are limited. The Association based its report on state surveys of 444,000 miles of streams, about one-fourth of the national total. Of the streams that states reported on:

- 296,000 miles (67 percent) maintained the same quality;
- 47,000 miles (11 percent) improved;
- 11,000 miles (2 percent) were degraded; and
- changes for the remaining 90,000 miles (20 percent) were reported to be unknown.[16]

It is clear that a substantial portion of the nation's waterways still have serious water quality problems. Yet, some perspective is useful here. Between 1972 and 1982, the population of the United States increased by 11 percent. During the same period, the amount of oxygen-demanding pollutants entering wastewater plants grew by 12 percent—yet the amount released into the waterways dropped by 46 percent. Without the Clean Water Act and the subsequent improvement in treatment capabilities, it has been estimated that these types of discharges would have been 91 percent higher in 1982 than the levels actually discharged.[17]

Not all environmental observers feel that the Act has had a significant impact, however. Researcher Henry M. Peskin notes that the most obvious water quality gain has been in the level of dissolved oxygen content, which he writes:

> is a questionable achievement: in 1972—before the Act—only about 30 percent of the nation's waters failed to meet acceptable dissolved oxygen standards. More important, 10 years of effort have produced very little improvement with respect to nutrients, sediment, and toxic substances...but serious problems with these pollutants are likely to remain indefinitely, chiefly because of the Act's relative neglect of the main nonpoint sources of pollution—agricultural and urban runoff.[18]

Even though the benefits of the Clean Water Act have been uncertain, the costs of complying with the law have been huge.[19] Between 1972 and 1984, government and private business invested approximately $120 billion in water pollution control equipment. Operation and maintenance costs, combined with depreciation, totaled $205 billion. During this period, an average of $25 billion a year was spent to control water pollution in the United States (see Table 2).

Despite the enormous outlay of funds, the House Public Works and Transportation Committee attributed the limited progress to financial difficulties: "... the program has not performed as well as expected due primarily to uncertainties in funding [and] insufficient levels of funding."[20] Obviously, members of Congress believe that the right *amount* of money will solve the problem. Unfortunately, they pay less attention to how effective these expenditures are.

The Investment Record

With the Clean Water Act, Congress established two "primary mechanisms"[21] for achieving water quality goals—sewage treatment construction subsidies and uniform effluent standards for point source dischargers. In terms of water quality improvement, this basic strategy has constituted a poor investment.

Since 1972, the federal government alone has spent $40 billion to subsidize the construction of local POTWs, but the money has not always been well spent.

Table 2

CUMULATIVE COSTS OF COMPLYING WITH THE CLEAN WATER ACT, 1972-1984[a]

(billions of 1981 dollars)

	Investment Expenditures	Operating Costs[b]
Government Expenditures	$ 95.0	$148.0
Private Sector Expenditures		
Fuels and Energy	5.8	17.7
Food Processing	2.2	12.7
Chemicals	8.3	12.1
Metals	3.5	5.2
Soft Goods	3.8	8.3
Other Manufacturing	1.3	1.3
Total	$119.9	$205.3

Notes: a. Costs include only those associated with federal actions resulting from the Clean Water Act. They do not account for costs voluntarily incurred by polluters, required by state or local governments only, or mandated by other federal laws.

b. Operating costs include operating and maintenance expenses as well as an allowance for depreciation of equipment.

Source: Environmental Protection Agency

For example, studies of local treatment facilities have demonstrated the existence of economies of scale. As the wastewater volume increases from 2 million to 8 million gallons per day, the unit cost of BOD removal declines 50 percent.[22] The consolidation of many small plants could have resulted in substantial savings. However, the grant program has consistently promoted the decentralization of treatment facilities.

The underlying cause of these inefficient expenditures is standard "pork barrel" politics. As is usually the case with major capital investments in public works, Congress has attempted to spread the grants around to as many members' districts as possible. As a result, the largest systems, which treat about 70 percent of the wastewater in the U.S., have received only 40 percent of the funds.[23]

For those systems that have received grants, EPA's technological requirements have increased construction costs and limited the use of alternative systems. An assistant executive director of the U.S. Conference of Mayors notes that "if cities had more flexibility on technology and specifications, they could stretch the federal investment infinitely further."[24]

Since 1956, the financial commitment to the construction of local POTWs has always been viewed as a federal "incentive" -- an effort to speed up compliance with effluent standards and advance the attainment of water quality goals. Professor Abel Wolman of Johns Hopkins University has disputed this presumption of a federal "impetus to construction." In examining prior annual expenditures without federal aid, he notes that the "intended acceleration of activities proved to be not much greater than was normally the case in history without federal or state grants."[25]

In fact, there is reason to believe that the grants program has often been a disincentive. An EPA report on the Composite Correction Program (CCP) offers some insights. Carried out over a two-year period in the state of Colorado, CCP's main purpose was to improve a specific POTW's compliance record by "identifying, prioritizing and eliminating specific factors that limit performance at an individual plant."[26] It stressed the development of alternative solutions to major, capital-intensive plant construction. The final report offered the following observations from interviews conducted with local administrators.

The largest treatment systems, which treat 70 percent of the wastewater in the U.S., have received only 40 percent of the construction grant funds.

- All owners felt a responsibility for their plant. However, their assessment of whether or not they were meeting that responsibility was often not related to plant performance. It was usually related to minimizing local costs and obtaining federal grants.
- Most owners/administrators of plants which were not in compliance expressed the opinion that [the matter] was out of their hands until they could get a grant.
- One operator felt he could have done better but was told by the "up-town" officials not to worry about it because doing better would hurt their chances [of getting] a grant.
- Four of five facility owners would not commit [themselves] to pursuing any recommendations of the CCP which required [more than] a very minor capital expenditure since they were waiting for grant funds.[27]

The Clean Water Act's regulatory strategy is also inefficient. The political appeal of uniform effluent standards is in their appearance of fairness. Ostensibly, all polluters are treated equally. Yet, within a given industry, not all firms will incur the same costs for the specified level of control.

Nationally uniform standards are also inefficient because they do not account for regional differences in the nature of water quality problems. Standards relate to effluent quality and not water quality, an orientation that ignores a key issue: The degradation of water quality prevented by effluent standards of ever-increasing stringency is slight, but the costs incurred can be huge.

Moreover, as an ever increasing degree of effluent purity is required, the marginal cost of each additional increment of pollution removal rises rapidly. For example, economists studying municipal wastewater treatment plants found that the cost of removing up to 90 percent of daily BOD is 22 cents a pound; roughly $1.70 a pound is required to remove an additional 5 percent, and $5.44 for the next 3 percent.[28] On average, the marginal cost of BOD removal at the third level is 20 times higher than the marginal cost at the first level.[29]

Sharply rising marginal costs are "pervasive" in water pollution abatement.[30] Thus, in the case of point sources where Best Practicable Technology has removed over 90 percent of toxic heavy metals such as lead or copper, the cost of removing the next 5 percent could very well exceed the cost of removing the first 90 percent. Yet, any benefits from the tighter controls will be more than offset by uncontrolled pollution from nonpoint sources.

Many environmentalists dismiss this type of analysis, claiming that because Best Available Technology will remove millions of pounds of toxics, there has to be *some* improvement in water quality. However, since many more millions of pounds of toxics enter the nation's water through runoff, it will cost a substantial amount to remove what is, in reality, only a tiny portion of the total amount of toxic water pollution.

In contrast, the nature of nonpoint sources seems to ensure that some potentially more cost-effective means of stormwater control will result in substantial pollution abatement. Civil engineers refer to the "first flush phenomenon" to describe the way in which storms transport pollutants; the initial stages of a storm carry a majority of the pollutants. Some studies have indicated that capturing this initial portion of a storm—approximately one-fourth of runoff flow—will result in a removal of nearly two-thirds of all toxic heavy metal pollutants.[31]

Administrative Shortcomings

Pursuing a policy of effluent standards is not only costly and inefficient; it is also an enormous undertaking. EPA had to issue discharge standards and permits; establish a functional enforcement procedure; and develop a nationwide monitoring network to track progress. Every aspect of EPA's administration of the program has been fraught with delays and difficulties.

Unrealistic expectations of the agency has undoubtedly contributed to EPA's problems. The legislation is complex and inflexible. EPA's technical capability has also been overestimated. Congress has repeatedly set unrealistic deadlines; in most cases standards were to be set within 120 to 180 days.[32]

Promulgating regulations for separate industrial categories is not a simple task, and EPA has never been given sufficient time to do it. This lack of adequate preparation further complicated the onerous burden of writing and issuing permits, which literally swamped the EPA and those states with EPA-approved NPDES programs. Between 1972 and 1976, 65,000 first-round permits based on "best professional judgment" were issued. This did little to insure the uniformity that Congress originally envisioned. In 1980, the House Public Works and Transportation Committee declared that the program was on the "verge of collapse"[33] and that it had become "a paper shuffling game of monumental proportions."[34]

The permit-issuing process has become "a paper shuffling game of monumental proportions."

EPA still faces a serious backlog of the five-year permits. The "second-round" of permit issuance continues to be delayed by the lack of effluent standards. Five out of 29 industrial guidelines have yet to be promulgated. In 1982 almost half of all "first-round" permits expired. By late 1984, almost all of the remainder expired as well. In addition, EPA has been unable to process applications for new permits. In 1982, for example, there was a waiting list of over 16,000 applications; an additional 2,000 applications are filed every year. As a result, the backlog is not likely to be reduced significantly at current levels of reissuance, leading many to suggest a permit with a longer life.

Economical Alternatives

Effluent Fees

Many economists have long advocated "taxing" pollution through effluent fees as a more efficient alternative to the current regulatory system. They argue that charging polluters for the pollution they create increases incentives for companies to find innovative ways to decrease their wastewater discharges.

Ideally, fees would be set equal to the marginal benefit of pollution control. As long as the marginal control costs are less than the fee, polluters would have an incentive to reduce the volume of polluted effluent, and to develop the most cost-effective control techniques.

These fees would have the effect of raising costs and hence prices for products whose production generates a lot of pollution. Consumer demand would tend to shift to products which pollute less. In order to stay competitive, high-polluting producers would have to economize on pollution, just as they would on any other costly factor of production. Since pollution imposes burdens on the environment, the costs of cleaning up that pollution should be reflected in the price of a product whose production generates this burden.

A study of the Delaware Estuary demonstrates the potential savings from such an approach. Effluent fees—once set high enough to achieve the desired level of water quality—would cost approximately one-half as much as a regulatory program relying on uniform standards requiring an equal percentage reduction by all polluters.[35]

In West Germany, federal water pollution control—a system of standards, permits, and enforcement—has not succeeded in reversing the decline of water quality all over the country. Yet, use of an effluent tax scheme in the Ruhr Valley has had a positive impact there, even though over two-thirds of the country's iron and steel production is located in the region.[36]

Genossenschaften are regional water associations authorized to manage water quality by special legislation. Each *Genossenschaft* charges polluters a fee based on their proportionate wasteload. Revenue is used to finance the association's activities. In effect, the fee amounts to a polluter's share of the association's operating costs. It does not relate to the treatment costs an individual firm would incur. The fee is also unrelated to important factors such as assimilative capacity.

Although the fee system does not fully adhere to principles of marginal-cost pricing, economists defend its effectiveness, noting that:

> A comparatively crude method that is generally correct in principle will often realize the major share of the gain that could be achieved by more complex and conceptually more satisfying techniques.[37]

Marketable Permits

For a number of reasons, effluent fees are unlikely to be utilized in the United States. Perhaps the most significant constraint on the use of this alternative policy tool is that it is not specifically authorized under the Clean Water Act. Even if the EPA were to attempt to implement one, a fee system could not withstand a court challenge, since Congress already considered it and rejected it.[38]

Despite restrictions imposed by the Clean Water Act, one alternative to the technology-based effluent standards approach has some potential for use within the confines of the law.[39] Under a system of marketable permits, a state agency distributes permits allowing discharge up to a level that would not compromise the desired standard of water quality. These permits could be either sold or simply issued outright, but in both cases dischargers could resell the permits to each other. In theory, at least, this "market" for permits would determine a price for each unit of pollutant based upon the cost for treating the last unit (marginal cost) of discharge under the most efficient method.

Many economists believe this approach would accommodate economic growth. A firm wishing to establish a new factory along a particular watershed would simply buy existing permits. No advance approval would be required for such a purchase. The total amount of discharge would have to remain constant, meaning that only those companies selling permits would have to adjust treatment processes because of the new discharge. Due to market forces, the firm selling a permit to the new discharger at the lowest price would also be the one facing the lowest costs for treating the additional waste. As a result, growth in the aggregate treatment system would occur using least cost methods.

One other advantage of marketable permits is that enforcement and administration of the process would be easier and more cost-effective. The agency would not have to handle the complex information of treatment technology. The choice of pollution control equipment would be left entirely to polluters;

they would directly suffer from using less than optimal pollution control techniques.[40]

Many practical innovations would produce a more cost-effective control policy. Besides effluent fees, and marketable permits, researchers have also advocated other cost-saving improvements such as the regionalization of municipal wastewater treatment[41] and the development and implementation of variable effluent standards. Regionalization would take advantage of the economies of scale in wastewater treatment, while variable effluent standards would relate permit requirements to seasonal variations in the assimilative capacity of a stream. For instance, a study of the DuPage River in Illinois concluded that the total variable cost of wastewater treatment could be reduced by 34 percent with seasonal adjustments to effluent standards.[42]

Nonpoint Source Control

These alternative regulatory procedures are designed largely to increase the efficiency of controls on point sources. Such innovations are worth pursuing in those instances where the marginal benefits equal or exceed the marginal costs. Nevertheless, as long as nonpoint sources remain uncontrolled, the current regulatory approach cannot fully resolve water quality problems in the U.S.

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Agricultural Pollution. According to the U.S. Department of Agriculture (USDA), agriculture is the "most widespread cause of nonpoint pollution."[43] Runoff from cropland, rangeland, pastureland, forest land and livestock facilities carries pesticides, fertilizers and animal wastes to adjacent streams. The USDA found that 15 percent of all fertilizer applied to cropland washes off into surface waters; 5 percent of applied pesticides runs off the land; and that 25 percent of all livestock operations have the potential to degrade water quality.[44]

Soil erosion can also be an important factor in agricultural pollution, since excess sedimentation reduces the natural assimilative capacity of a stream. Also, sediment often binds pollutants, which can cause dangerous concentrations to build up in a stream. USDA estimates that over 5 billion tons of soil are lost annually from agricultural lands. (An additional one billion ton loss results from eroding roadsides and construction sites.)[45] In 1934, soil was eroding at a rate of roughly three and one-half billion tons per year. The problem seems to have worsened despite the fact that the government has spent $18 billion on soil conservation programs.[46]

Obviously, soil conservation programs have not been properly targeted. Ninety percent of all "sheet and rill" erosion (caused by runoff) comes from only 10 percent of all cropland. The USDA believes that with better targeting three times as much erosion could be prevented at no additional cost.[47]

Large portions of the farm sector are in transition. Many of the old soil conservation techniques such as terracing have become too expensive in a farm economy of rising production costs and declining crop prices. Also, changes in equipment have forced some farmers to abandon old methods. Some equipment is too wide for old terraces; many windbreaks have been cut down because individual farmers have sought to increase the amount of acreage under cultivation.

Soil erosion is influenced by federal farm policies as well. With attractive price supports for certain crops, the federal government has induced many farmers to become "sodbusters" and plow up very fragile and erodable soil. Richard D. Siegel, a USDA deputy assistant secretary, says that "there is a direct connection between the degradation of fragile soil and the wheat price supports."[48] In 1984, for example, the federal target price for a bushel of wheat was nearly a dollar above market price, giving farmers strong incentives to plow up marginal land for the heavily subsidized crop. In the absence of high price supports, the amount of marginal acreage under cultivation would probably decline, since it is the least productive land.

There is no comprehensive policy prescription for the control of agricultural pollution. Too many natural factors are variable—climatic conditions, like the annual amount of rainfall, and physical features of the watershed, such as elevation and contour, are not uniform. These factors influence farm management decisions such as crops produced, and the use of fertilizer and pesticides. Of course, federal farm policies, consumer demand (both foreign and domestic), and the price of production inputs also affect management practices. Thus, this complex problem requires site-specific solutions.

Under authorization of Section 208 of the 1972 law, many nonpoint source control techniques were developed by state and federal officials. Even though many of these "Best Management Practices" (BMPs) have been shown to be cost-effective, they have not been widely applied. They involve: controlled frequency and timing of fertilizer and pesticide application; management of the timing and extent of irrigation; double cropping for continuous soil coverage; and conservation tillage. Besides clean water, farmers could undoubtedly accrue additional benefits from BMPs. For example, an excessive loss of soil and chemicals is expensive. Reducing these losses is obviously in the best interests of the farmer as well.

Conservation tillage is a general term used to refer to techniques that do not disrupt the soil as much as traditional farming methods. The most advanced type of conservation tillage is "no-till" plowing, a system that forgoes plowing up the residue from last year's crop; instead, it is left on the ground during the winter and through to the spring when a new crop is planted down through the residue. This has the effect of holding the soil and preserving its moisture. Also, the practice saves time, labor and energy costs associated with residue plowing.

Unfortunately, conservation tillage is no panacea. On farms with poor soil drainage, for example, such techniques may actually raise costs and lower average yields per acre.[49] Also, it is not entirely clear that these techniques decrease the amount of pesticides that wash off into streams.[50] Nevertheless, for a significant number of farms, these techniques remain an attractive option. In these instances, farmers will move toward these economical techniques without major government programs or "incentives" if they are properly informed about the benefits.

Currently, about one-fourth of all cropland is cultivated under some form of conservation plowing.[51] That percentage should increase if farmers become convinced that it is in their best interest to change their methods. In Iowa, for example, cropland acreage utilizing no-till plowing techniques increased nearly fourfold between 1980 and 1983. Acreage under conservation tillage increased by roughly one-fifth.[52]

Urban Runoff. As discussed previously, runoff from city streets is also a significant source of pollution. EPA data show that about one-half of the 127 priority pollutants listed by the agency are found in urban runoff samples at any given time.[53] The type of pollutants present and their concentrations depend on a number of related factors such as the degree of urbanization, the type of land use, population, the density of automobile traffic and the level of air pollution just prior to rainfall.

The degree of sedimentation can be the controlling factor in urban nonpoint source pollution. Even though sediment washed away from urban construction sites accounts for only 5 percent of sediment loads nationwide,[54] localized impact can be severe. A report from the U.S. Water Resources Council indicates that small construction sites in some eastern urban areas increase sedimentation of waterways up to 5,000 times.[55]

Controlling urban runoff can coincide with the control of flood flows. Runoff is caused by storms of an unusual intensity; a hard rain of long duration essentially overwhelms a city's capacity to contain storm flows. Sewers overflow and carry pollutants to waterways. Thus, flood control reduces pollution control.

Most cities already have detention basins as a primary method of controlling flood flows. These basins are readily convertible to accommodate another purpose, the removal and storage of polluted runoff. These adaptations have proven to be effective in many cases already. For example, in Montgomery County, Maryland, recently constructed detention basins prevent over 90 percent of pollutants from reaching surface waters.[56] Flood control is a local problem, the economics of which are not beyond the means of local authorities. The EPA's National Urban Runoff Program concluded: "Stormwater management planning need not involve expensive technical studies... Effective local planning can alleviate the need for costly remedial public works."[57]

Prospects for a Nonpoint Policy. Despite its potential as a cost-effective water quality improvement policy, controlling diffuse area sources has always been limited by political difficulties. An examination of the Clean Water Act's nonpoint source control provision—Section 208—bears out this conclusion. Section 208 was enacted in 1972; yet as late as 1980, the Council on Environmental Quality (CEQ) declared that progress on nonpoint source pollution was "negligible."[58]

Section 208's ineffectiveness has been attributed to its lack of binding authority and a general bureaucratic resistance at the state, local and federal level. Funding was also a problem. From its inception, both the White House and the Office of Management and Budget (OMB) were opposed to the program's 100 percent grants. By the end of the Carter Administration, 208 funds had been entirely eliminated; the Reagan budgets have never sought to restore them.

Political resistance to 208 is easily explained. Traditionally, authorities at every level of government have been understandably reluctant to regulate land use, which is likely to be an integral part of any control strategy. In fact, the relatively weak 208 provision was enacted to serve as a political straw man. Congressional staffers who drafted the 1972 legislation claim that this section was largely an effort to stave off a proposed National Land Use Act that had already passed the Senate twice.[59] Section 208 was a less intrusive alternative that everyone could support. Similarly, in 1984, House staffers drafting amendments to the Clean Water Act were forced to weaken their initial nonpoint source control provisions in order to keep support for the entire bill together. The key opposition to land use controls is, of course, agricultural interests—perhaps Washington's most effective lobbying force.

Obstacles to Innovation

A host of practical problems makes changes in the status quo in water pollution policy difficult. Many of the concerned parties—including both the regulators and the regulated—have an interest in maintaining the current approach, in spite of its many inefficiencies.

Consider the resistance to an effluent fees approach. Under a fees system, firms would have to pay a tax for each unit of pollutant discharge above zero. The total control cost is the cost of reducing pollution plus the charge for residual units of pollution. Under the effluent standards approach, there are no costs beyond those associated with reducing pollution to the mandated level.

Changing the system would produce winners and losers. Firms with high abatement costs under the current system would have the opportunity to save money under a fee system; they could reduce pollution to the point where the marginal control cost equals the charge and then pay the charge on any residual units. Yet, for firms currently meeting the standard at relatively low cost, controlling pollution to the point where marginal costs equal the effluent charge and then paying the tax on residual effluent could increase their costs.

A study of pollution control along a 30-mile stretch of the Black Warrior

Table 3

ESTIMATED COST OF CLEANUP IN 30-MILE SECTION OF BLACK WARRIOR RIVER UNDER ALTERNATIVE APPROACHES

Pollution Source	Daily Cost of Meeting Existing Standards	Daily Cost of Effluent Fees	Gain (+) or Loss (−)
Empire Coke	$ 116.00	$ 0	$ 116.00
B.F. Goodrich	72.90	0	72.90
Gulf State Paper	94.40	350.80	−256.40
Hunt Oil	30.40	5.60	24.80
Reichhold Chemicals	147.30	228.50	−81.20
Warrior Asphalt	15.90	3.20	12.70
City of Northport	122.20	145.20	−23.00
City of Tuscaloosa	1,240.40	491.10	749.30
	$1,839.50	$1,224.40	$615.10

Source: Water Resources Bulletin

River (see Table 3) bears out these conclusions. It would be less costly to achieve the same amount of control under an effluent fees system than under uniform standards—$1,224 a day, compared to $1,839 a day. Nevertheless, three of the seven major polluters—Gulf State Paper, Reichhold Chemicals, and the city of Northport—would pay more under a system of fees.[60]

The effluent fees approach has also had very little appeal in the political system, particularly among Congressional staffers. A study of attitudes among the most active participants in environmental policy formation found that most rejected a pollution tax on philosophical rather than practical grounds.[61] Specifically, they oppose charges on the grounds that they would constitute a "license to pollute." Also, they feel that putting a price on the act of polluting not only reduces the perceived value of environmental quality; it also amounts to an attitude of moral indifference towards polluters.

Finally, even when innovations and practical adjustments are potentially economical, they can be inconsistent with the provisions of the law. In effect, zero-discharge and swimmable/fishable goals often reduce the bill's flexibility, ultimately limiting EPA's ability to fight pollution. Even "goals" have legal ramifications. In the past, the courts have used them to interpret the Act.

In 1982, for example, efforts by the EPA to allow more state control over designation of the use of a particular stream were successfully challenged on the grounds that they were an abandonment of the swimmable/fishable goal. According to congressional aides who drafted the original bill, such use of the goals was not intended. Still, proponents of the current bill insist on retaining them in order to prevent a return to the largely ineffective "water quality standards" approach that dominated water pollution regulation prior to 1972.

Unfortunately, it appears the water quality goals have become just as obstructionist as the water quality standards approach was in preventing effective water pollution control. GAO notes that EPA has not exempted any waterways from the swimmable/fishable goal under the "wherever attainable" provisions.[62] Consequently, it has been automatically assumed that the goal should be obtained in all waterways, an over-simplification that ignores the costs and benefits of such actions.

Due to its own administrative burden, EPA is not really in a position to start tinkering with the program. The pretreatment program provides a good illustration of how bureaucratic resistance at the national level stifles local innovation.

In 1972, pretreatment standards were to be developed pollutant-by-pollutant, an impractical approach to comply with. In 1977, Congress forced EPA to develop a more comprehensive control program. First, EPA had to develop specific prohibitions that apply to all indirect discharges; these stress substances that would interfere with the effective operation and maintenance of the POTWs.

Next, all POTWs that receive waste from a significant number of indirect dischargers were required to establish a local program—their own legal, administrative and technical mechanisms with which to regulate them. EPA published these general regulations one year later but it has taken considerably more time to set up the final thrust of the program—the development of technology-based categorical standards, which are analogous to technology-based limitations for direct discharges.

The 1977 amendments also required EPA to establish industry-by-industry pretreatment standards for 65 toxics associated with 22 industrial categories. Since then, the number of targeted pollutants has doubled, and the list of associated industrial categories has been expanded to include 12 additional groups.

As EPA struggled to develop and issue technology-based standards for an ever expanding group of industries and pollutants, many cities simply went ahead and developed their own methods, some of which focus on water quality and not effluent quality. Not surprisingly, once the EPA succeeded in issuing their standards, a conflict ensued: Should localities be forced to replace their own programs with the federal one?

In the interests of regulatory reform, the EPA, under the controversial Anne Gorsuch Burford, proposed a "local option" in 1982. This program would have allowed cities with an effective pretreatment program already in place to exempt, either totally or partially, their industrial discharges from national standards—where these were deemed unnecessary to achieve water quality goals, or to meet the basic requirements of the law.

As the reauthorization debate dragged on, environmental groups lobbied effectively against the local waiver provision and congressional support waned.

EPA support was withdrawn in 1983 when the new Administrator, William Ruckelshaus, reluctantly decided in favor of national standards on the grounds that the review of waiver applications would overwhelm the agency and delay implementation of the whole program. This policy stands under the current Administrator, Lee M. Thomas.

Current Legislative Proposals

Since 1981, the reauthorization of most major federal environmental laws has been stalled. Serious divisions in Congress have left a number of laws—including the Clean Air Act and the Safe Drinking Water Act—in a legislative limbo. Nevertheless, the 99th Congress appears intent on reauthorizing the Clean Water Act this year.

On the opening day of the first session, leaders of the House and Senate environmental committees introduced bills to renew the Act. By May 1985, committee markup of this legislation was concluded. On June 13, 1985, the Senate unanimously approved S.1128. In the House, H.R.8 is due to reach the floor for a vote in July or August of 1985.

The Major Issues

None of the proposed amendment packages offers any dramatic changes in policy. An examination of six major Clean Water provisions follows, with emphasis on the differences and similarities of the three bills in these areas.

BAT/BCT Compliance Deadlines. The 1977 amendments directed EPA to develop more stringent standards for industry--Best Available Technology (BAT) for toxic pollutants and Best Conventional Technology (BCT) for conventional pollutants. These were to be issued quickly enough for industry to reach compliance with the standards by July 1, 1984. To date, final regulations for five out of 22 industrial categories have not been promulgated, causing industries, particularly the chemical industry, to miss this deadline.

While there is general agreement that the compliance deadlines need to be extended, there is some disagreement over exactly how this should be done. S.1128 requires compliance three years after the final BAT regulations are promulgated, but in no case later than July 1, 1988.

A bill drafted by the administration also requires dischargers to come into compliance within three years after final promulgation, but its outside deadline is more flexible than the Senate's. For effluent limitations (in whole or in part) established prior to July 1, 1985, the final date is July 1, 1988. For those standards promulgated after July 1, 1985, dischargers must comply within three years from the date final regulations are issued. H.R.8 is the most generous of all the bills. Like the administration's bill, it establishes a rolling deadline for compliance, allowing a maximum period of three years and six months after final promulgation.

Permits. The current life of a discharge permit under the Clean Water Act is five years. Many observers contend that the five-year term has led to serious backlogs in permit issuance and reissuance. In addressing this problem, all three bills originally offered provisions that would extend the life of permits to 10 years. Each bill also contains a discretionary "reopener" provision that would allow permit modifications in cases where more stringent requirements are established by EPA.

However, during the markup of S.1128, environmental groups lobbied effectively against an extension, arguing that a 10-year permit would "freeze" pollution cleanup for too long a period because states rarely reopen permits in midterm. Thus, the final Senate bill retains the current five-year permit.

Post-BAT Water Quality-Based Effluent Limitations. Both the Senate and House bills contain provisions that would require states to identify "toxic hot spots"—those segments of streams that still do not meet water quality standards after all BAT controls are in place. Once these segments are listed, EPA and the states would then have to set individual control strategies for them. The legislation stresses a further control of point sources. Where they deem it necessary, the states and the EPA would develop standards from some dischargers that would be even more stringent than BAT.

S.1128 proposes a series of program deadlines—nine months for EPA to develop basic identification guidelines for the states; two years for the identification of "hot spots" by the states; two years for proposing new control requirements; and three years for industry compliance with the new standards.

H.R.8 expands the EPA role and tightens deadlines. The EPA, in cooperation with the states, would have one year to identify "hot spots," and an additional year to develop new standards. As in S.1128, industry would have three years to comply, however.

Nonpoint Source Control Programs. Both the House and the Senate are also seeking to implement nonpoint source control programs at the state level. H.R.8 directs states to develop a four-year program within nine months. If a state fails to submit a plan by that deadline, EPA must develop one for it. The federal agency must rule on all states' plans within six months of their submission. The bill authorizes $600 million over four years in grants to the states for up to 50 percent of program development costs.

In the Senate plan, states have 18 months to submit their plans and EPA has six months to evaluate plans. The Senate bill authorizes a total of $300 million to be spread over a three year period, with $200 million earmarked for grants distributed proportionately to states on the basis of a set formula. These grants can cover up to 75 percent of a state's program development costs.

Construction Grants. With the authorization for construction grants due to expire on September 30, 1985, the future direction of the program has received more attention than any other topic in the Clean Water Act debate. The administration bill is the most austere, calling for a complete phase out of the program over four years. The bill authorizes an initial $2.4 billion for 1986, and cuts this by 25 percent each year until the money runs out in 1990. The proposal also restricts funding to the completion of projects begun prior to February, 1985. And, in order to concentrate available funding on ongoing projects, the bill eliminates "set-asides" for innovative or alternative projects, and rural programs. "Governor's discretionary funds"—which allow states to use money for purposes other than construction—are also eliminated.

The House bill authorizes $2.4 billion annually (the current grant level) in construction grants for four years. The proposal acknowledges that the construction grants program is winding down, and seeks to supplement it with a new type of financial aid to states. H.R.8 contains a four-year authorization of $6.6 billion in capitalization grants for the establishment of state revolving funds. States would be able to use the fund for construction loans and loan guarantees, interest subsidies on bonds and loans, and bond guarantees.

The Senate bill seeks to continue some form of construction funding through 1994. S.1128 authorizes $2.4 billion annually in construction grants for three years. A phasing out of these grants begins in 1989. The bill also contains a grant program for the capitalization of state revolving funds. An annual authorization of $2.4 billion would be split between the two programs for two years. In 1991, the entire $2.4 billion authorization would be devoted exclusively to capitalization grants. Over the next three years, this authorization would be reduced by 25 percent each year until the entire program is phased out.

Conclusion and Recommendations

Congress has consistently rejected the use of market oriented methods of controlling water pollution. It is surprising, however, that Congress also appears to be rejecting many minor reforms and innovations that could facilitate the implementation of water pollution policy and heighten its impact on water quality.

There are ample opportunities to improve the basic regulatory structure of the Clean Water Act. While there is little short-run prospect of fundamental reform—such as an effluent fees system—there are some practical adjustments that should be made to improve the efficiency of the current policy and make it more reasonable for both government and industry.

Establish Flexible Compliance Deadlines. The July 1, 1984 BAT compliance deadline has passed without EPA regulations being issued for five industry groups. Congress should grant these industries a reasonable amount of time, both to install the necessary equipment and to work out any difficulties with it after EPA standards have been established.

In the past, Congress has consistently set unrealistic deadlines, only to be forced to revise them once it became clear that they could not be met. The Senate plan—with its absolute deadline of July 1, 1988— represents more of this sort of wishful thinking. The Senate provision that allows up to three years from final promulgation for compliance should be retained and the specific outside deadline deleted. Congress should adopt the approach proposed by the Administration and the House. Though each differs in the amount of time allowed, both establish a rolling deadline that links compliance to the date of final promulgation.

Extend Permit Life to 10 Years. The current backlog of five-year permits cannot be eliminated at current levels of reissuance. Before state and federal authorities can even complete reissuance of permits already expired, previously reissued five-year permits will begin expiring once again. A 10-year permit will reduce the annual workload and help ensure that large backlogs do not accumulate in the future.

The extended life of the permit would be a move toward realism. Even when the permit issuing process is running efficiently, it takes at least one year for a final permit to be issued. Also, it can take up to three years to install the mandated treatment technology. The five-year limit does not really provide an adequate amount of time to test the effectiveness of treatment before the renewal application process opens. For the permit holder, a longer term would provide more certainty over the long run, making investments in pollution control technology more economical.

Shifting to a longer permit term should facilitate the modification of existing permits. Expired permits are enforceable, but their guidelines will not necessarily fulfill the goals of the Act. Most of the "first round" permits provide solely for the control of conventional pollutants. They do not always effectively control toxic wastes.

Despite its many advantages, the Senate and environmentalists oppose the 10-year permit on the grounds that it would somehow "freeze" cleanup for a decade. These claims are simply not valid. First, use of the 10-year permit would still be subject to limitations. For example, any permit with certain waivers would be held to a five-year term. Also, if a state and the EPA determine that a permit applicant has not consistently complied with any existing permit, the reissued permit would be restricted to a life of five years. According to the House Committee Report on the Clean Water bill,

> ...nothing in this provision infringes on the Agency's ability to establish shorter terms where the Agency deems it appropriate. Given the wide variety of permits and recognizing that the agency is just beginning to issue many major permits with toxic limitations for the first time, it is understood that EPA will need the flexibility to set maximum permit terms of less than ten years for some dischargers.[63]

Finally, any proposal for the new permit can contain an adequate reopener provision that would allow permit modification necessary to ensure that more stringent standards can be incorporated.

Expand Local Control over Pretreatment. Under ideal circumstances, localities should be able to design their own pretreatment programs. Pretreatment is a local problem. Plants that discharge into publicly owned treatment works (POTWs) are likely to differ in terms of the factors that determine the scope and necessity of a given pretreatment program. The type, the volume, and the extent of industrial wastes, as well as plant design and record of performance, are just a few of the possible variables.

Plants that already have an adequate pretreatment program should be given the option to disregard national standards. For example, an intensive study was conducted on 41 POTWs in the state of Illinois, where it was determined that 86 percent of the in-stream plants discharging into POTWs were pretreating these wastes. The POTWs were not disrupted by industrial toxics, and they were meeting permit requirements. It was also determined that for 25 of the 41 POTWs studied, imposition of the federal pretreatment model would not result in any significant improvement in the existing program. For 13 of the POTWs, a federal program would result in "limited enhancement." Thus, at an estimated administrative cost of $1.5 million to the state, only one POTW would see significant improvement.[64]

Uniform standards for pretreatment create some questionable anomalies among various toxics. When James Peterson of the Illinois Institute of Technology compared the proposed pretreatment standards with the average treatment capabilities of an indirect discharger in particular industrial categories, he discovered that for some toxic metals the allowable discharge limits were 10 to 25 times lower than what could be removed under existing technology. Proposed limits for other wastes were 10 times higher than the amount that could be economically removed.[65]

Regrettably, cities who want a statutory waiver amendment to be incorporated into the Clean Water Act, and their allies in Congress (notably Senator Steven D. Syms, R-Idaho), appear to have given up their efforts to secure one. Instead, municipalities appear to be focusing their lobbying efforts on preserving the construction grants program.

Phase Out Construction Grants. Localities need to reassume responsibility for financing the construction of wastewater treatment plants. Federal grants were supposed to supplement local funding but instead have replaced it. Grants have often hindered progress—by causing project delays and overly complex treatment systems to be built.

All three current legislative proposals seek to phase out construction grants, but both the House and Senate bills would still maintain a substantial level of construction funding in the form of seed money for state revolving funds. Admittedly, this alternative approach has some appeal. It would give states more flexibility in meeting their wastewater treatment needs. Yet, it does little to promote the local responsibility that is so lacking in the current grant program.

Most state governments are in better fiscal condition than the federal government. According to the EPA, over half of all future construction will have to occur in the Northeastern and Great Lakes regions of the country. Significantly, many of the larger states in these regions are proposing tax cuts for fiscal 1986.[66]

Many states and localities are capable of financing their own construction, and establishing their own revolving funds. Georgia has already set up a revolving fund with state bonds. California, Mississippi, Utah, Ohio, New York, New Jersey, Massachusetts, and Texas have all proposed similar programs in their state legislatures this year.[67] The introduction of federal grants for the same purpose at this time will only discourage these efforts and similar efforts in other states.

Recent studies have demonstrated that it is possible to achieve water quality goals with reduced construction spending. For example, the Colorado Composite Correction Program compared the costs of upgrading existing plants with the estimated costs of construction under the Clean Water Act grant program, and found that the cost of complying through renovation averaged 19 percent of building a brand new plant.[68] An EPA study in Onondaga County, New York, concluded that relatively low-cost Best Management Practices (BMPs)—incorporating some minor system modifications and sewer maintenance—are "remarkably effective" in the abatement of combined sewer overflow.[69] If such overflows contribute substantially to a municipality's water quality problems, a small investment in BMPs would yield more immediate and certain improvements than a major investment in a new POTW.

Delay Any Post-BAT Strategy until Nonpoint Source Controls Are in Place. It will make little sense to proceed beyond Best Available Technology (BAT) guidelines for industrial polluters—at least until more municipalities come into compliance and an effective nonpoint source control program is implemented. Increasing the stringency of effluent guidelines at this point will result in very high control costs, but the benefits of this approach will be slight.

Though not designed to do so, use of Best Practicable Technology has resulted in substantial removal of many toxic heavy metals; in at least 26 industrial categories, annual discharges of lead, copper, zinc, and mercury were reduced by 90 percent or more.[70] More stringent BAT controls will reduce these toxics only slightly. The cost of removing a small amount of toxics beyond the BAT level of treatment may very well cost as much as it did to remove the first 90 percent. However, the water quality improvements resulting from these controls would be marginal, especially if nonpoint source pollution goes unchecked. In contrast, small investments in nonpoint controls will pay off in much larger returns.

A post-BAT program should not be codified in the Clean Water Act. As former EPA Administrator William S. Ruckelshaus has noted, EPA can carry out a post-BAT plan within the existing provisions of the law.[71] EPA should retain this discretionary power to implement programs. A congressional mandate could force EPA to take hastily conceived and inappropriate actions, particularly when Congress sets unrealistic deadlines.

Limit the Federal Presence in Nonpoint Control Programs. The site-specific nature of nonpoint pollution places clear limitations on the role of the federal government. A national program must be limited to oversight activities, information gathering, technical assistance and limited financial aid. Physical geography does not always coincide with the political map. There are many interstate waterways and watersheds. Thus, for nonpoint control programs to be effective, they must be regional in scope; a downstream state could implement the best possible set of BMPs, but unless its upstream counterpart did likewise, water quality would not improve appreciably. Thus, where states cannot come to an agreement, the federal government must assume responsibility for arbitration.

In contrast, groups such as the National Audubon Society and the League of Women Voters are advocating a stronger national program, with strict deadlines, and a clear and major federal commitment. Yet in doing so, they ignore the capability of state authorities and state programs that already exist. Currently, 44 out of 50 states have managed to develop EPA-approved nonpoint plants.[72]

A more uniform national program might rule out cost-effective linking of a nonpoint control program with other local interests like stormwater flood control or soil conservation. Measures taken to manage these other problems will bring about incidental (yet substantial) reductions in nonpoint pollution. Indirect control is the most attractive means of achieving water quality goals because relatively small investments will pay off in numerous benefits.

A multi-purpose control program will consist of Best Management Practices (BMPs)—a set of land use and land management policies. It seems unlikely that the long arm of the federal government could extend itself enough to implement an effective national BMP system, much less develop one. The abundance of potential variables requires that BMPs be as site-specific as possible, and traditionally, these regulatory issues have come under the jurisdiction of state and local authorities. Thus, any federally-initiated nonpoint control policy would depend on the active support of local governments. Also, because the federal government is already involved in ancillary activities like flood control, interagency cooperation is essential.

In agriculture, a major new federal initiative seems inappropriate. Rather what is needed is close cooperation between EPA's clean water activities and a variety of existing soil conservation and agricultural pollution control programs. The Department of Agriculture currently sponsors the Agricultural Conservation Program, the Soil Conservation Service, and, in cooperation with the EPA, the Rural Clean Water Program. Also, the Forest Service has attempted to control nonpoint sources through a variety of programs. Better management and coordination of existing programs should be a top priority.

In considering an overall policy mechanism to encourage farm nonpoint source control, these agencies and Congress should consider the successes and failures of government inducements in the past. Political reality demands uniform distribution of government incentives. Thus, subsidies and other financial "carrots" have a tendency to become transfer programs that have little impact on the problems they were intended to solve.

The best way to encourage farmers to use conservation techniques is to do just that: encourage them. If a government program can demonstrate the economic advantages of such techniques to a farmer, there will be little need to do anything else. The Soil Conservation Service has had considerable success already, simply through the use of this method. And, of course, any overall farm policy that improves the farm economy in general will create a more positive climate for innovation.

Notes

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